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OPERATIVE SURGERY

COVERING

THE OPERATIVE TECHNIC INVOLVED IN THE OPERATIONS OF GENERAL AND SPECIAL SURGERY

By

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VOLUME VI

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OPERATIVE SURGERY

CHAPTER LXXXII

OPERATIONS UPON THE SEMINAL VESICLES AND EJACULATORY DUCTS

Surgical anatomy of the seminal vesicles, p. 1; _ Surgical anatomy of the ejaculatory ducts, p. 1.

Operations upon the vesiculæ seminales, in general, p. 2; _ Exposure of the seminal vesicles for vesiculotomy, or vesiculectomy, by the perineal route, through an inverted Y-shaped or U-shaped incision, p. 2; _ Exposure of the seminal vesicles for vesiculotomy, or vesiculectomy, by the ischiorectal route (Voelker's technic), p. 4; _ Exposure of the seminal vesicles for vesiculotomy by combined ischiorectal and perineal routes (Fuller's technic). p. 8; _ Exposure of the seminal vesicles by the suprapubic, retrocystic, extraperitoneal route (Young's technic), p. 11.

SURGICAL ANATOMY OF THE SEMINAL VESICLES AND EJACULATORY DUCTS

(A) Vesiculæ Seminales

Description.—Two diverticular, membranous, seminal reservoirs placed between the bladder and the rectum _ lying external to the ampullæ of the vasa deferentia _ their upper extremities being subperitoneal. They average, in length, about 6.3 cm. ($2\frac{1}{2}$ inches) _ breadth, about 1 cm. ($\frac{7}{16}$ inch) _ thickness, about 6 mm. ($\frac{1}{4}$ inch).

Relations.—Superiorly; base of bladder, from near entrance of ureters to base of prostate gland. **Inferiorly;** rectum, with the rectovesical fascia intervening. **Anteriorly;** converging, unite with vasa deferentia (which lie to their inner side) to form the ejaculatory ducts. **Posteriorly;** the free ends diverge, overlapping the ureters, which pass between the vesiculæ seminales and the bladder. The rectovesical pouch of peritoneum covers the upper part of the posterior aspect of the seminal vesicles.

(B) Ejaculatory Ducts

Description.—Formed by union of vasa deferentia and vesiculæ seminales of each side. They are about 2 cm. ($\frac{3}{4}$ inch) in length. Beginning at base of prostate, they pass forward and downward between the middle and lateral lobes _ perforate the prostatic fissure _ and empty at or within the margins of the sinus pocularis, in the prostatic portion of the urethra. Their coats are fibrous, muscular, and mucous.

Arteries of Vesiculæ Seminales and Ejaculatory Ducts.—Artery of vas deferens, of superior vesical branch of internal iliac; inferior vesical, of internal iliac; middle hemorrhoidal, of internal iliac; middle vesical, of internal iliac.

Veins.—Accompany arteries.

Lymphatics.—End in pelvic glands.

Nerves.—From hypogastric plexus.

OPERATIONS UPON THE VESICULÆ SEMINALES, IN GENERAL

In vesiculotomy, or spermatocystotomy, the seminal vesicle is incised for the purpose of relieving tension, evacuating fluid, and establishing drainage.

In vesiculectomy, or spermatocystectomy, the vesicula seminalis is excised.

The chief indications for vesiculotomy are: – acute suppurative vesiculitis, or ampullitis – recurrent epididymitis and urethritis, associated with either acute or chronic vesiculitis – and vesiculitis, acute or chronic, supposed to be associated, causatively, with rheumatic arthritis.

The chief indications for vesiculectomy are: – local tuberculosis – tumors – and chronic vesiculitis.

The operative procedures for the exposure of the vesiculæ seminales for the performance of vesiculotomy usually also serve for vesiculectomy – but not necessarily the reverse. For instance, if the seminal vesicle were exposed for its excision by the abdominal route, and it were determined, upon exposing the structure, to simply incise and drain, drainage here would necessarily be up hill – whereas exposure by the perineal, or ischiorectal routes, undertaken for excision, would, if incision were found sufficient, furnish dependent drainage.

The three most usual general routes of exposure are: – the perineal – ischiorectal – and abdominal – of which there are several different technics.

The perineal and ischiorectal routes are the ones most frequently employed (especially the former) – and the abdominal, the least frequently.

The features of exposure of the prostate gland, the vesiculæ seminales, and the ejaculatory ducts are all more or less intimately connected.

EXPOSURE OF THE SEMINAL VESICLES FOR VESICULOTOMY, OR VESICULECTOMY, BY THE PERINEAL ROUTE – BY INVERTED Y-SHAPED OR U-SHAPED INCISION

Description.—The exposure of the seminal vesicles by the perineal route, whether for incision or excision, is accomplished by an incision, and through a technic which has so much in common with the exposure and excision of the prostate gland through the perineum, that it seems unnecessary to go at length into the details of the procedure here – when so many operative technics for the exposure of the prostate gland will be given in the immediately following pages. The salient features of the operation, however, will be outlined.

Preparation.—As in Voelker's operation (v. p. 4).

Position.—In marked lithotomy posture.

Landmarks.—Perineoscrotal junction – anus – ischial tuberosities – known anatomic relations.

Incision.—Either the inverted Y-shaped incision of Young may be employed – the median incision beginning at the perineoscrotal junction and extending to within 2.5 cm. (1 inch) of the anus, extending thence obliquely outward, on each side, to a point over each ischiorectal fossa, half-way between the anus and the ischial tuberosities – or the bow-shaped incision of Kocher (with upward convexity, extending from one ischial tuberosity to the other, with its convexity reaching forward, to the lower border of the pubic symphysis).

Operation.—The skin and superficial fascia are divided throughout the incisions – until the median tendon of the perineum is exposed anteriorly and in the median line, and the fatty areolar tissue, in the ischiorectal fossæ. In the anterior median incision, the bulb of the urethra and the accelerator urinæ muscle, which extend from the median line forward and outward on

either side, are exposed – and the median ends of the transverse perineal muscles, extending outward from the posterior aspects of the bulb to the ischial rami (Fig. 5154). In the lateral limbs of the incision the fatty areolar tissue is dissected through down to the inferior surface of the levatores ani – and, on each side, the inferior hemorrhoidal vessels and nerve, posteriorly; and the

Fig. 5154.—Structures of the Deep Perineum – the illustration serving as a guide in operations upon the prostate when used, as here, in the dorsal posture – and as a guide as to the anatomy of the approach to the seminal vesicles and ejaculatory ducts when kept in this, or turned in the reversed direction (v. Voelker's operation, Fig. 5155): – a, Bulbous urethra; – b, membranous urethra; – c, prostate gland; – d, erector penis muscle; – e, transverse perineal muscle; – f, levator ani muscle; – h, gluteus maximus muscle; – g, rectum.

transverse perineal vessels and nerve, the artery and nerve of the bulb, and the superficial transverse perineal muscle, anteriorly – are all retracted forward. The fibers connecting at the central tendinous point, the external sphincter ani and the accelerator urinæ, more superficially, and the recto-urethralis, more deeply, are now severed, transversely, near to the bulb – after which the bulb and transversus perinei are retracted forward. Then, incis-

ing still more deeply, transversely, in the direction of the posterior aspect of the bulb, the posterior fibers of the compressor urethræ muscle, covering the inferior aspect of the membranous urethræ, are brought into the field. The prostate gland covered on its postero-inferior aspect by a dense layer of connective tissue (part of its capsule from the pelvic fascia) lies above the compressor urethræ muscle. The vasa deferentia lie upon a still deeper plane, approaching toward each other as they run downward – and just to the outer side of these the vesiculæ seminales lie – which are the goal of the operation. The dissection by a blunt instrument is continued upward and above the prostate, in the connective-tissue plane separating the prostate, anteriorly, from the rectum, posteriorly. The object now is to draw the prostate downward, nearer the outlet of the wound, and, with it, the seminal vesicles. This may be accomplished in various ways; – an appropriate retractor may be placed over the superior aspect of the prostate, by which it is drawn downward – or the membranous urethra may be limitedly incised, and Young's prostatic tractor inserted and its blades afterward opened, by which the gland is drawn downward – or Squier's method may be used, of inserting two strong silk sutures as temporary tractors, into the prostate and bladder wall, at the junction of prostate and bladder, at the highest lateral aspect of the prostate. In this manner the fascia overlying the seminal vesicles is exposed, and brought within reach. Either the right or the left vesicle may be then exposed by making an oblique incision through this fasica directly over it – or both seminal vesicles may be exposed by incising this fascia transversely, and then displacing it upward by blunt dissection.

Once exposed, the vesiculæ seminales may be either incised, with the establishment of drainage – or incised, cureted, and drained – or excised. Owing to the ease with which drainage-tubes may be here displaced, they should be held in position by anchoring sutures. The more or less extensive wound is closed by buried layer-suturing, with catgut, up to the exit of the drain. Temporary bladder drainage is usually indicated – which may be accomplished either by an anchored meato-urethral soft catheter – or, if the membranous urethra have been opened for the use of Young's prostatic tractor, then through this urethral opening by the perineal route.

EXPOSURE OF THE SEMINAL VESICLES FOR VESICULOTOMY, OR VESICULECTOMY, BY THE ISCHIORECTAL ROUTE

VOELKER'S OPERATION

Description.—The incision of approach is here made over the ischiorectal fossa of the involved side. Subsequently, if it be desired to expose the opposite seminal vesicle, the original incision is extended upward, alongside of the coccyx, which is excised, and the median border of the wound retracted far enough to the opposite side to make the exposure of the opposite seminal vesicle possible. In this exposure (which partakes largely of the features of the Kraske operation for the excision of the rectum) one or both seminal vesicles can be either incised or excised – and, also, one or both ampullæ. The vas deferens of the side of the original incision can be tracted to the internal abdominal ring and excised – and, possibly, also the opposite vas deferens. The operation may be performed solely for the purpose of incising or excising the seminal vesicle or vesicles, together with the ampulla or ampullæ – or may be undertaken as part of an extensive procedure for removing the seminal tract of one entire side – the seminal vesicle, ampulla, and vas deferens, up to the internal ring, being removed by the following technic – and the testicle, and vas deferens, up to the internal abdominal ring, being

removed by incising the scrotum and laying open the inguinal canal (as described in Vol. V, pp. 827, 840, and 842).

Voelker's technic, as described by Rumpel, will be here largely followed.

Preparation.—Bowels emptied. Bladder partly filled, at the early stage of the operation, for the purpose of localization, and subsequently emptied by catheter, to secure greater room for manipulation. Perineum, ischiorectal, and sacrococcygeal regions cleansed and disinfected.

Position.—The patient may be placed either in the pectorolateral (Sims') position _ or, as Voelker prefers, in the prone position, over the end of the table, with the thighs hanging downward (so as to round out the field of operation _ and stretch apart the barriers which obstruct approach to the deeper structures involved) _ in spite of the danger of anesthetization in this position.

Landmarks.—Anus _ coccyx _ ischial tuberosity _ known anatomic relations.

Incision for the Exposure of the Left Seminal Vesicle.—A straight incision is made over the left ischiorectal fossa, parallel with the median line, and extending from the base of the coccyx, or the last lumbar vertebra, to a level with the upper part of the anus (Fig. 5155).

Fig. 5155.—Excision of the Vesiculæ Seminales Through a Para-sacro-coccygeal Incision _ Voelker's Technic _ I; _ The incision.

Operation.—Having passed through the skin and fascia, the great muscle mass of the gluteus maximus is encountered, and its fibers incised and retracted (Fig. 5156) _ beneath which lie the resistant sacro-ischial ligament. Incising to the inner side of the latter or through its fibers, the left ischiorectal fossa is opened up, with its loose fatty areolar tissue. After passing through this loose connective tissue, by blunt dissection, the obliquely running fibers of the levator ani will be encountered. Some branches of the inferior hemorrhoidal vessels are due to be coursing over this muscle and to require tying and dividing. The levator ani muscle is now incised _ either upon a grooved director carried beneath it, or by free-hand, from without, inward (Fig. 5157). The cut margins of the levator then retract, exposing in the depth of the wound the perirectal and pericystic (bladder) fascia. The visceral layer of the bladder fascia is split in the middle line _ thereby opening up the approach to the rectum, prostate, and seminal vesicle _ which are further exposed by blunt dissection.

The view of the structures is considerably bettered by the introduction

of the Assistant's finger into the rectum (Fig. 5158) and the digital displacement of them to the left and upward into the wound – when the prostate gland will appear in the lower angle of the wound – the rectum, in the median aspect of the wound – and the seminal vesicle and ampulla, laterally and behind. The seminal vesicle and ampulla may be partially, or entirely mobilized, by blunt dissection, and brought into the wound by forceps. More or less free venous bleeding, from the vesicoprostatic plexus, may be expected at this stage – and is to be met by temporary gauze packing, hot-water douch-

Fig. 5156.—Exposure of the Seminal Vesicle for Vesiculotomy, or Vesiculectomy, by the Ischiorectal Route – Voelker – I; – The superficial incision over the left ischiorectal fossa: – a, a, s, s, The divided gluteus maximus muscle retracted; – b, sacrococcygeal margin; – c, ischiosacral ligament; – f, ischiorectal fatty areolar tissue; – e, levator ani muscle; – d, d, branches of the inferior hemorrhoidal vessels. (Figs. 5155–5158 modified from Rumpel.)

ing, and the ligation of accessible bleeding vessels. The further steps of the operation will depend upon the findings made after the exposure of the structures to vision and touch.

If vesiculotomy (spermatocystotomy) be indicated, as is often the case in infected spermatocystitis, the focus, or foci of involvement are incised by knife, cutting into the structure of the seminal vesicle – the fluid contents of the cavity emptied – and provision made for drainage through the wound of approach.

If vesiculectomy (spermatocystectomy) be indicated, this may now be accomplished by completing the freeing of the seminal vesicle. It is immaterial as to whether the freeing of the structure begin from above or from below. The vessels which supply the seminal vesicle, and are seen running to the organ, are ligated _ and the connections with the prostate cut through. It is optional, according to circumstances, as to whether the ampulla be removed _ and as to whether or how much of the vas deferens be excised. If castration have been performed (and the scrotal and inguinal vas have been excised) in advance of exposing the seminal duct and ampulla, and it

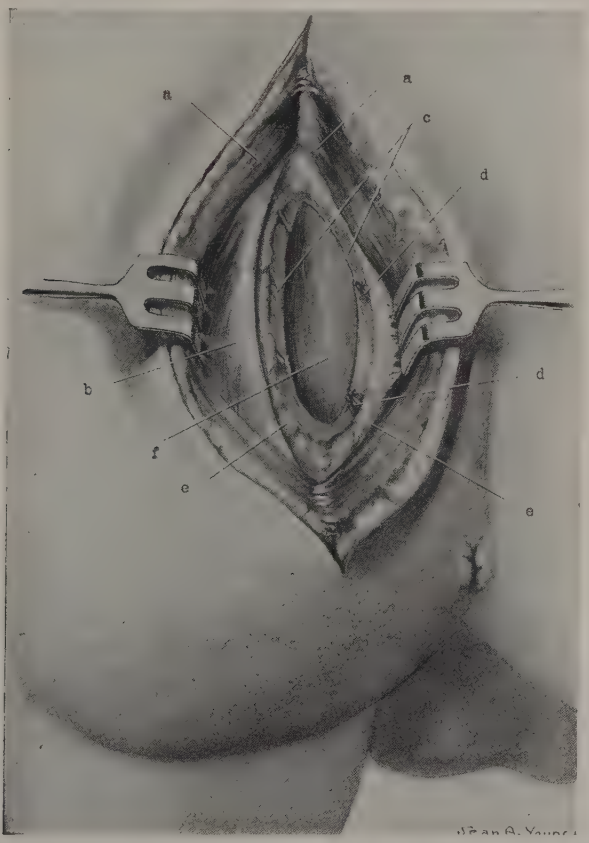

Fig. 5157.—The Same _ II; _ The deeper wound: _ a, a, Divided and retracted gluteus maximus; _ b, ischiosacral ligament; _ c, incised levator ani muscle; _ f, visceral layer of the bladder fascia; _ d, d, ligated inferior hemorrhoidal vessels; _ e, e, ischiorectal fatty areolar tissue.

be now indicated to continue the excision of the seminal tract, then the ampulla and the whole of the vas may be excised _ so as to meet, at the internal abdominal ring, the end of the excision previously carried on, from the scrotum, up to that point.

If, besides dealing with the seminal vesicle, ampulla, and vas deferens on the left side, it be also decided to examine, or similarly deal with the corresponding structures upon the right, then this may be accomplished without making any additional skin incision, through the following maneuver: The original incision is prolonged upward, sufficiently far, if not already so carried

at the start, to expose the sacrococcygeal junction – at which level the coccyx is excised with bone-cutting pliers – after which the median border of the wound is forcibly retracted to the right – thereby giving access to the right seminal vesicle. The rectum is also drawn further to the right by a blunt retractor. The right seminal vesicle and ampulla are now seized with forceps and drawn into the field, as on the left side – to be dealt with as indicated – either by incision or excision, with or without the similar treatment of the corresponding ampulla and vas. This added exposure on the right side gives considerably freer access to the posterior wall of the bladder.

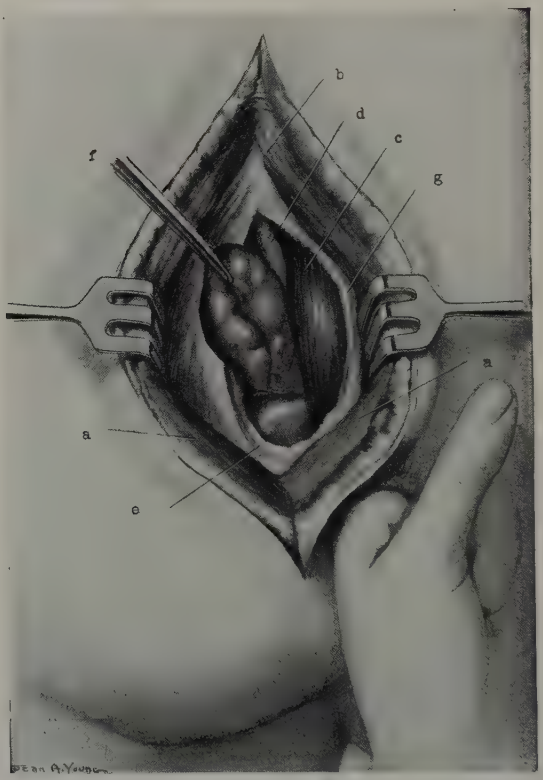

Fig. 5158.—The Same – III; – Exposing and freeing the left seminal vesicle: – a, a, Divided gluteus maximus overlying the deeper marginal structures; – b, sacrococcygeal margin; – g, ischiosacral ligament; – c, rectum protruded by a finger within; – e, prostate gland; f, left seminal vesicle brought out into the wound by forceps; – d, vas deferens. This increased exposure of the structures is brought about by the Assistant's finger in the rectum, pressing to the left and outward.

The method of treating the wound in concluding the operation will largely depend upon the nature of the special case – but, as a rule, drainage of this deep and extensive field is practically always indicated.

EXPOSURE OF THE SEMINAL VESICLES FOR VESICULOTOMY BY COMBINED ISCHIORECTAL AND PERINEAL ROUTES

FULLER'S OPERATION

Description.—The vesiculæ seminales are exposed through a squarish type of U-shaped incision, made axially over both ischiorectal fossæ, and trans-

versely across the perineum, with the patient in the knee-chest position. Guided by a finger in the rectum, the seminal vesicles are exposed by the sense of touch _ their lower ends incised _ and drainage established.

Preparation.—As in Voelker's operation.

Position.—The patient is put under anesthesia, and then steadied, by means of uprights at the end of the table, between which he is suspended by inguinal straps, in the knee-chest position.

Landmarks.—As in Voelker's operation.

Incision.—Two slightly converging incisions are made over each ischiorectal fossa _ beginning, above, opposite the sacrococcygeal junction _ each passing downward and inward, between the ischial tuberosity and the anus, to a point about 3 cm. ($1\frac{3}{16}$ inches), both anterior to and outside of the anal

Fig. 5159.—Exposure of the Seminal Vesicles, for Vesiculotomy, by Combined Ischiorectal and Perineal Routes _ Fuller's Operation _ I; _ Making the ischioperineal incision.

orifice _ whose anterior limits are then connected by a transverse incision extending across the perineum.

Operation.—When these incisions have been outlined through the skin, into the superficial fascia, the Surgeon introduces his left index-finger into the rectum, as a guide, henceforth, in the subsequent manipulations, and for the purpose of safeguarding the structures within the field. With the finger thus used as a director the original incision is everywhere deepened (Fig. 5159) _ especially through the tissues between the anus and the urethra _ dividing the central perineal tendon and the recto-urethral muscle _ and opening up the way to the prostate. The right index-finger in the wound is largely employed as a blunt dissector, guided by the left index-finger within the rectum. Thus progressing chiefly by digital manipulation, the position of the seminal vesicles is reached, which are detected by touch, but cannot be seen. When the rectum has been safely separated, by blunt dissection from the fascial

sheath of the seminal vesicle, and held posteriorly, by retraction, a grooved director is carried into the sheath of the seminal vesicle, and a narrow, straight bistoury is conducted along the director, with its back toward the rectum, and makes a small opening through the fascial sheath into the seminal vesicle – which, after reassurance and examination by digital examination, is enlarged as far as required. The incision alone may suffice, or curetage of the interior of the vesicle may also be carried out. The same technic may be applied to the opposite seminal vesicle. Finally, a length of rubber tubing is carried into each incised vesicle, and brought out through the transverse part of the external wound, to the margins of which it is anchored – being

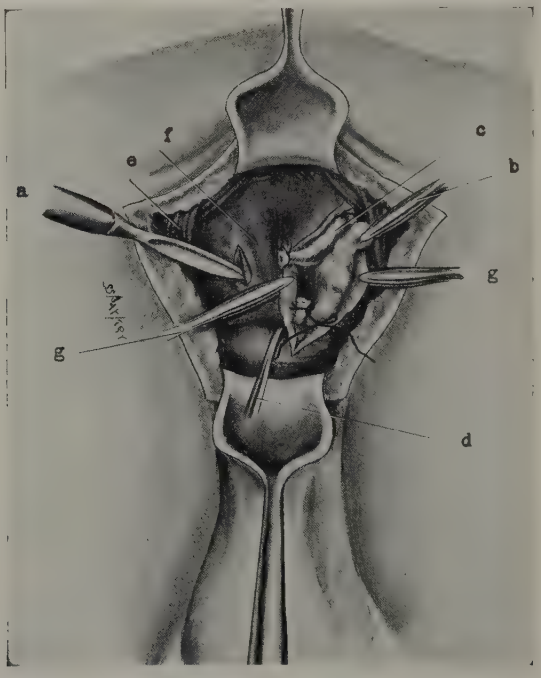

Fig. 5160.—The Same – II; – The boundaries of the wound are retracted upward and downward – giving, here, an exaggerated fulness and superficiality of exposure – as well as also illustrating vesiculectomy, b, and partial vasectomy, c (the vas is being excised, in part, between ligatures), as well as vesiculotomy, a; – d, prostate retracted downward; – e, levator ani muscle; – f, bladder; – g, g, fascial sheath incised, exposing vesicula seminalis and ampulla. Vesiculotomy and drainage alone constitute the Fuller technic.

retained in position from one to two weeks. The rest of the wound is closed by buried and superficial sutures.

Comment.—Care is taken not to damage the sphincter of the anus.

After the levator ani muscles are cut, the area between the prostate and rectum is dissected entirely in the dark, by blunt dissection with the finger, guided entirely by the Surgeon's sense of touch and interpretation of tissues, until the lower end of the seminal vesicles are exposed – which are then incised upon a grooved director.

After bluntly dissecting the bladder from the rectum, in the progress of the exposure, the posterior surface of the bladder is followed upward until the seminal vesicles are encountered, and separated, also by blunt dissection, from the rectum.

In Fig. 5160 is shown, semidiagrammatically, the general relationships encountered in such an exposure – but exaggerating both the nearness of the structures to the surface and the fulness and freedom of their exposure – for, as explained above, the technic is conducted more by touch than by sight – in fact, the deep structures dealt with are operated upon practically by feeling alone.

EXPOSURE OF THE VESICULÆ SEMINALES – BY THE SUPRAPUBIC, RETROCYSTIC, EXTRAPERITONEAL ROUTE

YOUNG'S OPERATION

FOLLOWED BY THE EXCISION OF THE SEMINAL VESICLE, AMPULLA, AND PART OF THE VAS DEFERENS

Description.—The excision of the seminal vesicle, together with the ampulla, and part of the vas deferens, of one side – through the abdominal wall through a T-shaped incision of approach. The posterior aspect of the bladder is first exposed by a median suprapubic incision, with the addition of a transverse incision at its upper end. Through this combination of incisions, which do not pass into the peritoneal cavity, the peritoneum, when encountered, is peeled away from the posterior wall of the bladder, and as far as necessary from the abdominal wall, until the vesiculæ seminales are exposed. The involved seminal vesicle is then removed – with or without the adjacent ampulla in its course to the internal abdominal ring – and as much of the vas deferens as may be indicated.

Preparation.—Bowels emptied. Bladder partly filled. Pubic and suprapubic regions shaved.

Position.—Patient in Trendelenburg position. Surgeon to patient's left. Assistant opposite.

Landmarks.—Symphysis pubis; median line; known relations of the parts.

Incision.—T shaped. The median suprapubic incision is made from just above the umbilicus to the symphysis pubis. The transverse incision, about 7.5 cm. (3 inches) in length, extends across the upper end of the vertical incision, just above the umbilicus and in the linea transversa. The median incision passes between the recti muscles – and the transverse incision divides them as far as it extends.

Operation.—The median incision is carried down in the median line just as in median abdominal section – passing through the fascia posterior to the recti – down to but not through the peritoneum. The peritoneum, having been exposed, is carefully separated from the posterior wall of the bladder in the median line – keeping comparatively near the median line, to avoid severing many of the nutrient vessels of the bladder by separating the peritoneum too far laterally. Upward traction of the posterior bladder wall – while, at the same time, pressing backward the rectum – aids the separation of the peritoneum from the back of the bladder. The vasa deferentia are thus exposed and freed from the bladder by blunt dissection – during which the vesiculæ seminales are encountered, lying slightly to the outer side, and are similarly freed. Both the vesicula seminalis and the ampulla are divided close to the upper border of the prostate gland. The vas deferens is then traced on outward over the lateral aspect of the bladder to the internal abdominal rings – and there ligated and divided. In concluding the operation the transversely divided recti are repaired with chromic gut. The longitudinal wound is sutured as in abdominal section – leaving the lower portion open – through which a temporary drain is usually conducted.

Comment.—Hemorrhage is controlled by gut ligaturing and gauze packing. Briefly summarizing the operation, the steps are: _ Separation of peritoneum from base of bladder _ Separation of rectum from base of bladder _ Excision of the vesicula seminalis, and ampulla vas deferens as far out as the internal abdominal ring. Guard the ureters by adhering to the area as near the middle line as possible. They are made easier of detection by upward traction upon the bladder. A sound introduced into the bladder during the progress of the operation will often be of aid.

OPERATIVE INVOLVEMENT OF THE EJACULATORY DUCTS

The ejaculatory ducts are chiefly involved, surgically, in the removal of the prostate gland _ and reference to this bearing of the subject will be found under Operations Upon the Prostate Gland, p. 13.

CHAPTER LXXXIII

OPERATIONS UPON THE PROSTATE GLAND

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Partial prostatectomy by the perineal route (Young), p. 45; _ Total extracapsular prostatectomy by the perineal route, along with excision of the bladder neck, followed by union of the bladder with the urethra (Young), p. 56; _ Partial prostatectomy by the perineal route (Albarran), p. 61 _ Total extracapsular prostatectomy by the perineal route, along with the excision of the bladder neck, followed by union of the bladder with the urethra (Albarran), p. 70; _ Partial extracapsular prostatectomy by the perineal route (Proust), p. 73; _ Partial extracapsular prostatectomy by the perineal route (Parker Syms), p. 78; _ Perineal partial prostatectomy by median external urethrotomy and finger enucleation (Watson), p. 81.

Partial prostatectomy by the combined method by median suprapubic cystotomy and median perineal section (Alexander), p. 84.

Partial prostatectomy in some limited forms of obstruction by the intra-urethral punch method (Young), p. 86; _ Transurethral prostatectomy by galvanocautery for prostatic obstruction, p. 87.

The Prostate Gland

SURGICAL ANATOMY

Description.—A fibromuscular glandular body in front of the neck of the bladder and surrounding the beginning of the urethra, placed posteriorly and inferiorly to the symphysis pubis and posteriorly to the triangular ligament, and resting upon the rectum. Its measurements are the following: _ transversely at base, about 4 cm. ($1\frac{1}{2}$ inches); anteroposteriorly, about 2.5 cm. (1 inch); depth, abouth 2 cm. ($\frac{3}{4}$ inch). The prostatic urethra pierces the gland generally one-third nearer the posterior than the anterior aspects, _ though it sometimes passes nearer the anterior aspect, _ and sometimes only the inferior three-fourths of the urethra is surrounded by the prostate. The ejaculatory ducts pierce the gland obliquely forward between the middle and lateral lobes, opening into the prostatic portion of the urethra. The glands of the prostate open into the prostatic sinuses. The prostatic sinuses lie upon either side of the verumontanum in the prostatic part of the urethra.

Capsule of Prostate Gland.—Firm, thin, fibrous membrane derived from the rectovesical portion of the pelvic fascia _ separated from the superior layer of the deep perineal fascia by a plexus of veins.

Divisions of Prostate Gland.—(1) Two Lateral Lobes _ deeply notched posteriorly and slightly furrowed anteriorly. (2) Middle Lobe _ a small, irregularly shaped prominence upon the posterior aspect of the gland, between the two lateral lobes, lying above the sinus pocularis and between the ejaculatory ducts _ and placed directly under the neck of the bladder, posterior to beginning of urethra.

Fixations.—Held in place by the anterior or puboprostatic ligaments of bladder; by the superior layer of the triangular ligament; and by the anterior part of the levatores ani.

Base of Prostate.—Directed upward and backward. Lies somewhat above level of center of symphysis pubis, resting upon and connected with neck of bladder.

Apex.—Directed downward and forward, resting upon superior layer of triangular ligament. Lies about 1.3 cm. ($\frac{1}{2}$ inch) behind and slightly inferior to the subpubic angle. By rectal examination, about 3 cm. ($1\frac{1}{4}$ inches) above the edge of the anus.

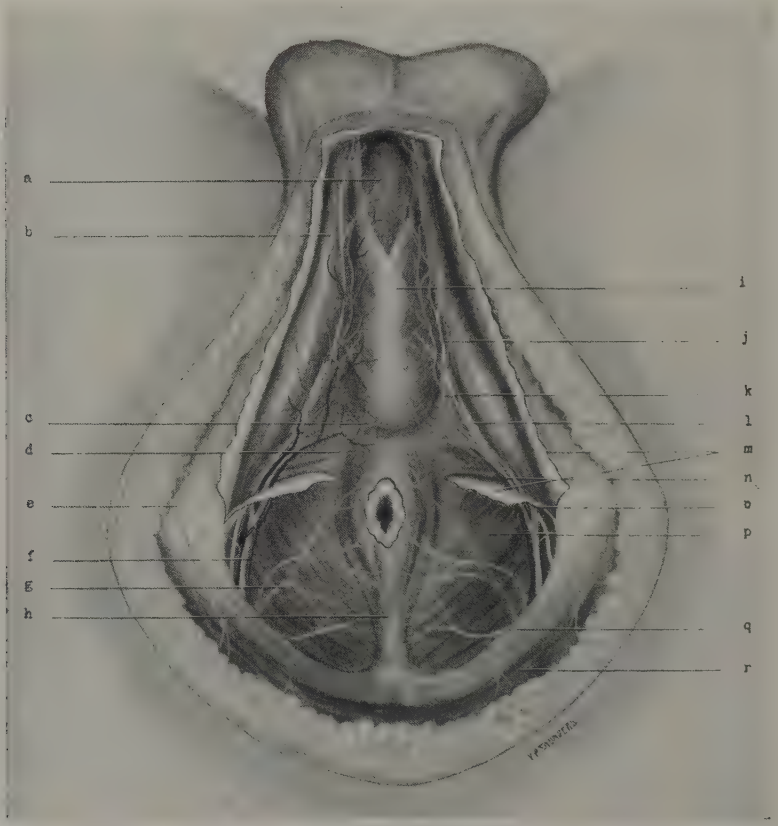

Fig. 5161.—Anatomy of Male Superficial Perineum: – a, Corpus spongiosum; – b, erector penis (m. bulbocavernosus); – c, transverse perineal vessels; – d, superficial transverse perineal m.; – e, perineal cutaneous (rami perineales) and inferior pudendal branches of small sciatic n.; – f, internal pudic artery and veins; – g, inferior hemorrhoidal artery and nerve; – h, sphincter ani; – i, accelerator urinæ m. (m. bulbocavernosus); – j, perineal nerve; – k, n, superficial perineal artery; – l, superficial layer of triangular ligament; – m, superficial perineal fascia; – o, internal pudic artery; – p, levator ani m.; – q, gluteal cutaneous branches of small sciatic n. (nn. clunium inferiores); – r, gluteus maximus m. (Modified from various Anatomies).

Anterior Surface.—Convex. Lies about 2 cm. ($\frac{3}{4}$ inch) posterior to lower aspect of symphysis. Covered by prostatic plexus of veins, by puboprostatic ligaments, and by vesicopubic muscle.

Posterior Surface.—Flattened. Rests upon anterior aspect of rectum, some dense connective tissue and muscular fibers intervening.

Lateral Surfaces.—In relation with superior surfaces of levatores ani and the lateral portions of the venous plexuses. Extend upward as two indistinctly defined lobes.

Arteries.—Branches of inferior (and probably middle) vesical, from anterior trunk of internal iliac; branches of hemorrhoidal arteries; branches of internal pudic.

Veins.—Receive dorsal vein of penis and form plexuses about anterior and part of lateral aspects of gland _ and empty into branches of internal iliac vein.

Lymphatics.—End in pelvic glands.

Nerves.—Form hypogastric plexus.

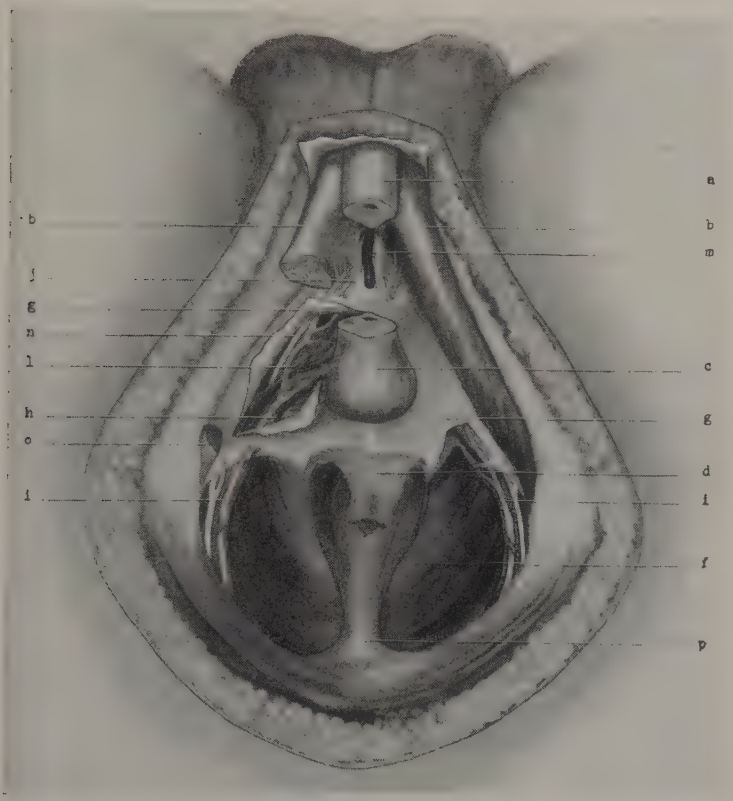

Fig. 5162.—Anatomy of the Male Deep Perineum: _ a, Corpus spongiosum; _ b, b, corpora cavernosa; _ c, bulb of corpus spongiosum; _ d, external sphincter m.; _ f, levator ani m.; _ g, superficial layer of triangular ligament; _ h, deep layer of triangular ligament; _ i, i, internal pudic vessels and n.; _ j, dorsal artery and nerve of penis and artery of crus; _ l, compressor urethræ muscle; _ m, dorsal vein of penis; _ n, dorsal nerve of penis; _ o, divided crus of penis; _ p, coccyx. (Modified from various Anatomies.)

The Fascial Surroundings and Connections of the Prostate Gland.—The planes of fascia which surround the prostate are of especial surgical importance _ the descriptions of which complicated structures differ very materially in different works upon the subject. The following account is quoted from the writings of Young:

"The prostate is surrounded on all sides by aponeuroses which fix it to the middle of the perineum, forming what the French call the *loge prostatique*. Proust compares the prostate, encased in its loge, with a tooth in its alveolus. These fasciæ are so complex that I have not the space to fully describe them. . . . Suffice it to say that the prostate is surrounded and bound to the

pubis, triangular ligament, bladder, rectum, and lateral pelvic walls by reflections of the retrovesical fascia. This fascia springs from the white line, passes over the internal surface of the levator ani muscle, and divides into three layers: – (**1**) A superior, or anterior, which passes above the prostatic plexus of veins, over the anterior surface of the prostate, to which it is adherent as well as to the pubis; – (**2**) A middle layer, which passes beneath the lateral prostatic plexus of veins and behind the posterior surface of the prostate; – and (**3**) a posterior layer, which hugs the anterior surface of the rectum. The

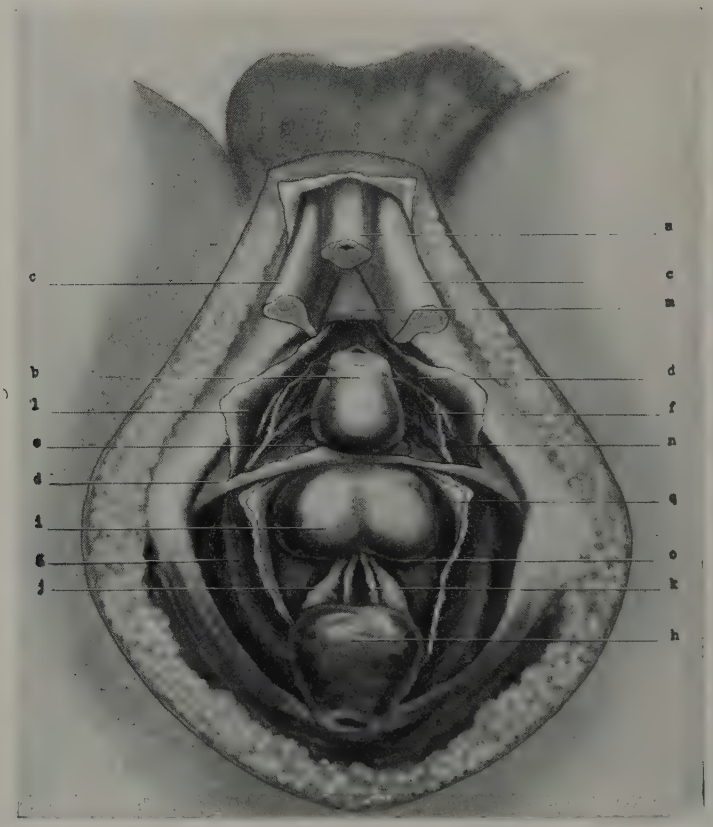

Fig. 5163.—Anatomy of the Deeper Male Perineum: – **a**, Corpus spongiosum; – **b**, bulb of corpus spongiosum; – **c**, **c**, corpora cavernosa; – **d**, **d**, superficial layer of triangular ligament; – **e**, Cowper's gland; – **f**, compressor urethræ m.; – **g**, levator ani muscle; – **h**, rectum; – **i**, prostate gland; – **j**, right seminal vesicle; – **k**, left vas deferens; – **l**, dorsal nerve of penis; – **m**, symphysis pubis; – **n**, branches of internal pudic artery and vein; – **o**, bladder. (Modified from various Anatomies.)

last two layers are loosely attached to each other and constitute the aponeurosis of Dénonvilliers. Anteriorly this fascia (retrovesical) is reduplicated and forms two strong fibrous bands, known as the puboprostatic ligaments, between which is a space containing a venous plexus (of Santorini), to which the dorsal vein of the penis is tributary. The periprostatic plexus of veins is in reality incorporated in the anterior layer of the retrovesical fascia, and Proust pictures two layers of this fascia between which the plexus lies. Between the sheath and the capsule of the prostate are various fibrous communications which are more intimate anteriorly than posteriorly. Cunéo and Veau have

shown that the aponeurosis of Dénonvilliers, which is composed of the middle and posterior layers of the fascia described above is derived from a downward prolongation of the peritoneum in fetal life which becomes obliterated later. The serous surfaces disappear, but the fibrous coats remain and are easily separable. In approaching the prostate from the perineum it is necessary to divide the posterior layer, which is closely attached to the rectum, in order to expose the posterior surface of the prostate, to which the anterior layer

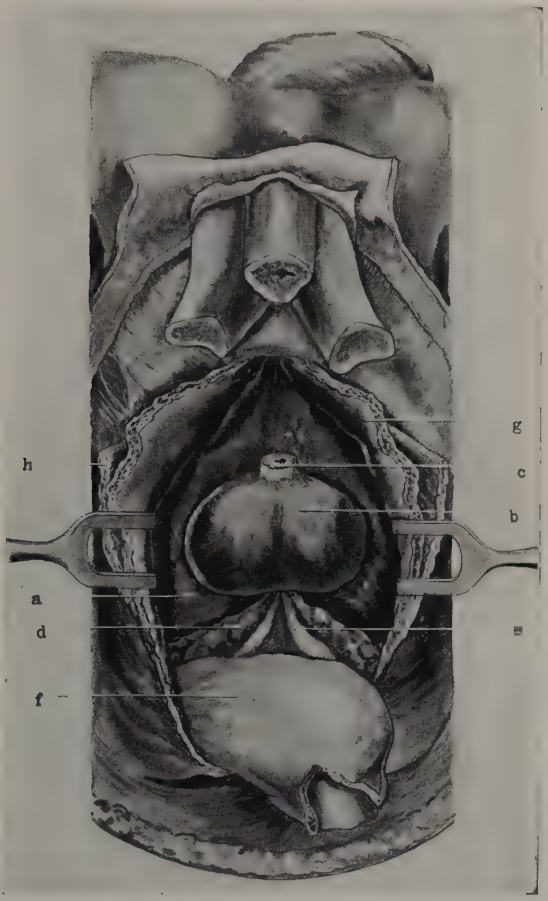

Fig. 5164.—Relations of the Prostate Gland and Adjacent Structures: – a, Bladder; c– b, prostate gland; – c, severed membranous urethra divided; – d, right vesicula seminalis; – e, left vas deferens; – f, rectum; – g, cavernous tissue of vesicoprostatic venous plexus; – h, levator ani muscle. (Redrawn from various Anatomies.)

of Dénonvillier's fascia is closely attached. This fascia is continuous below with the deep layer of the triangular ligament. From there it extends upward along the posterior surface of the prostate (as above described) and thence over the posterior surfaces of the seminal vesicles, the vasa deferentia, and the vessels and nerves accompanying them. It forms a fascia of considerable thickness and apparently acts as a definite barrier to the backward extension of malignant prostatic disease. The fact that the lymphatics and vessels extending upward from the prostate lie in front of and do not perforate it,

shows the importance of carrying the line of removal behind it in the operative treatment of cancer of the prostate.

"The fascia which covers the posterior wall of the bladder also has important relations with the seminal vesicles and prostate. At the upper ends of the seminal vesicles this fascia splits, one layer passing in front of the vesicles and ampullæ of the vasa deferentia, and one behind. That which passes in front, between these structures and the bladder, passes downward until it reaches the prostate, upon the capsule of which it runs forward, separating this thin, superiorly projecting portion of the lateral lobes from the bladder. Toward the median line it accompanies the ejaculatory ducts within the prostate, forming the anterior part of their fascial covering, or 'tunnel.' That portion of the vesical fascia which passes behind the seminal vesicles also

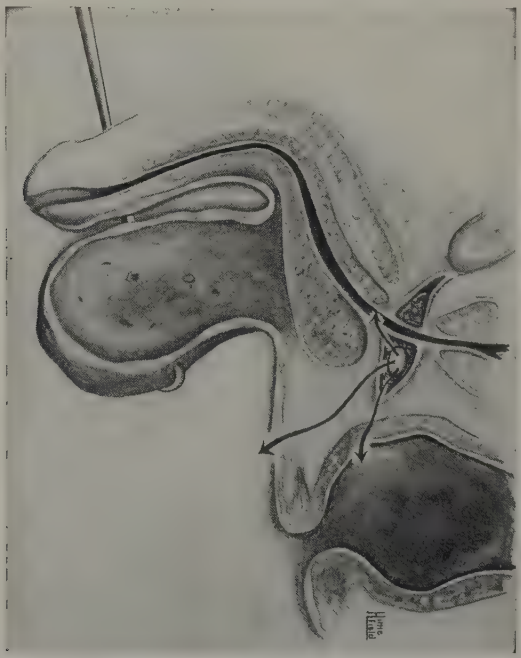

Fig. 5165.—Position of Cowper's Gland Between the Layers of the Triangular Ligament – and the directions in which suppuration of the gland may evacuate – into the deep urethra – into the rectum – and into the perineum.

continues downward, forming the posterior covering of the vesicles and vasa, and being incorporated and continuous with the fascia of the posterior surface of the prostate (apparently being inseparable from the anterior leaf of Dénonvillier's aponeurosis). Along the outer edge of the vesicles and along the inner edge of the vasa deferentia the two sheets of vesical fascia are united, thus forming an enveloping capsule on each side and binding these structures firmly against the base of the bladder."

PERINEAL PROSTATOTOMY FOR EVACUATING PROSTATIC ABSCESSES

Intraprostatic abscess (prostatic abscess proper) occurs within the prostate gland – and is one of the terminations of acute prostatitis. They are within the gland itself, and are limited by the prostatic capsule.

Periprostatic abscesses occur in the immediate vicinity of the prostate gland — and while their source of origin is generally other than from within the prostate (such, for instance, as in connection with conditions of the vas deferens, seminal vesicles, urethral periphlebitis, and the like) — it may sometimes be the secondary involvement of an intraprostatic abscess. The positions in which periprostatic abscesses usually occur are the following: — (*a*) Retroprostatic — in the prerectal area — the most frequent site; — (*b*) Lateroprostatic — tending to involve the ischiorectal fossæ; — (*c*) Supraprostatic — the pus tending to localize between the seminal vesicles (also called retrovesical).

The directions in which these abscesses tend naturally to rupture are: — into the rectum (most frequently) — into the urethra and rectum — upon the perineum — and in the ischiorectal fossæ.

The usual methods of operating for prostatic abscess, are several — grouping themselves under two main heads, — stab-incision, in the dark, through the perineum — and incision after exposure by deliberate dissection. The latter is the more surgical procedure, especially where the nature of the surrounding structures and their relationships are such as they are — and where, in addition, the exact nature and position of the abscess is not definitely known in advance. The incision of a prostatic abscess through the rectum, after the introduction of a speculum, is now no longer practised.

The indication is for immediate opening upon discovery, before prostatic tissue is extensively destroyed, or the abscess ruptures into the rectum, ischiorectal fossæ, urethra, or even peritoneum.

(*a*) **Opening Prostatic Abscess by Stab Incision in Median Prerectal Perineum, Guided by Finger in Rectum.**—This is probably the best of the stab-in-the-dark methods, as the finger in the rectum serves as something of a guide. The perineum having been shaved and prepared, and the bowels emptied, the Surgeon introduces his left index-finger into the rectum, with the pulp of the finger-tip uppermost (the patient being in the lithotomy position). With the tip of this finger the point of maximum fluctuation is located or, in its absence, upon the apex of the prostate, or just posterior to it — and then, with a long, straight bistory, the point of the knife is entered about 2.5 cm. (1 inch) in front of the anus in the midperineum, and, guided by the rectal finger, is carried into the prostate gland — the knife being carried in the pathway between the bulb and the membranous urethra, in front, and the rectum, behind, toward the tip of the intrarectal finger. In the act of withdrawal the incision is enlarged as indicated, especially at its outlet. While the finger is still within the rectum a pair of long, sinus-forceps are carried through the wound, from which pus is flowing in the opposite direction and the tract of the incision, especially its upper end, stretched in the act of withdrawing the forceps. Next, the Surgeon carries his right index-finger into the abscess and breaks down any septa which may be encountered. Finally, a rubber drainage-tube is carried into the cavity and anchored at the perineal skin. Through this the cavity is irrigated — and subsequently drained. If marked bleeding occurs, as is sometimes the case, gauze must be packed around the rubber tube drain.

(*b*) **Opening Prostatic Abscess by Stab Incision in the Lateral Prerectal Perineum, Guided by Finger in Rectum and Sound in Urethra.**—The Surgeon's left index-finger is passed into the rectum, as in the preceding technic, or in its absence, upon the apex of the prostate — while a metallic sound passed into the urethra is steadied in the median line by an Assistant, as a guide. Thus guided, a narrow, straight bistoury is entered about 1.3 cm. ($\frac{1}{2}$ inch) to the side of the median perineal line, upon which the abscess

is (with the patient in the lithotomy position), and about 2 cm. ($\frac{3}{4}$ inch) in front of the anus — and is carried onward into the abscess — the outlet of the wound being enlarged in the withdrawal of the knife, whose cutting edge is directed upward — and afterward the apex of the wound may be stretched with forceps, so that the finger may enter and examine the cavity. The general features of manipulation and drainage are, otherwise, the same as in the procedure just described.

(*c*) **Opening Prostatic Abscess Through a Median Perineal External Urethrotomy Incision.**—External perineal urethrotomy into the membranous urethra is performed upon a medially grooved sound, as in operating for urethral stricture (v. Vol. V, p. 668). When the membranous urethra has been incised, a finger is introduced into the membranous urethra, and carried, thence, into the prostatic urethra, dilating it. Alongside of the finger a narrow bladed bistoury, cutting only at its end, is passed, and the edge of its short, sharp portion then turned toward the fluctuating site, recognized by the finger, and made to cut through the wall of the prostatic urethra, through the intervening sound prostatic tissue, if any, into the prostatic abscess. Sometimes the opening into the abscess, from the prostatic urethra, is made with the finger-tip alone, by boring, as it were, or, better, by the nail of the finger-tip if it be sufficiently pronounced.

(*d*) **Opening Prostatic Abscess Through a Lateral Perineal Lithotomy Incision, Except that the Urethra is not Incised.**—The initial step of the procedure is that of a lateral perineal section performed for removal of vesical calculus (v. Vol. V, p. 546). With the patient in the lithotomy position, and a metallic sound steadied in the median line by an Assistant, an incision is made as for the usual lateral perineal section, upon the side of involvement, or upon that side which it may be considered will afford the most direct route to the site of suppuration. Having divided the skin and superficial perineal structures only — the finger is introduced into the incision thus made, and, by a combination of blunt dissection and tunneling the deeper perineal structures are penetrated — until the sound can be felt through the intervening urethra. When this is recognized, the blunt dissection is continued, between the point of first contact with the urethra-covered sound and the apex of the prostate, when, reversing the position of the finger, by turning the pulp outward, without withdrawing it — and using the pulp of the tip of the finger as a director, a narrow knife, with cutting edge only at its end, is carried along the finger — and into the site of suppuration within the prostate gland. The rest of the technic is as already described.

(*d*) **Opening Prostatic Abscess by Deliberate Exposure of the Prostate Gland by Dissection Through a Prerectal, Transversely Curved, Perineal Incision.**—This method of procedure is the one chosen by many Surgeons for all prostatic abscesses — and should always be selected, even if not a routine habit, in all cases apt to be complicated or uncertain in nature — for it possesses the desirable features which always accompany deliberate dissection. Many of the features here employed are in common with the exposure made for the partial or total removal of the prostate gland — except that incision only of the gland is performed. The technic carried out by Proust will be given.

The patient is placed in the lithotomy position, at the end of the table and a metallic sound carried into the bladder. A curved prerectal incision, with backward concavity, is carried across the perineum — its median aspect being placed over the bulb, and its ends reaching nearly to the ischial tuberosities. To secure additional room the bulb is drawn slightly forward while making the incision. The incision passes down through skin and fascia.

The oval flap thus represented is dissected free and displaced backward. The bulb is simultaneously drawn forward – and the external sphincter (anobulbar fibers) is picked up between two forceps and divided (Fig. 5166, **d**). Beneath this the recto-urethral muscle (v. Fig. 5166, **e**) is cut near to the urethra, upon the posterior face of the bulb – thereby exposing the rectoprostatic space. In this space, between rectum and prostate, blunt dissection is carried on by the finger, carefully keeping between the rectum, which is to be guarded, and the prostate; which is to be exposed.

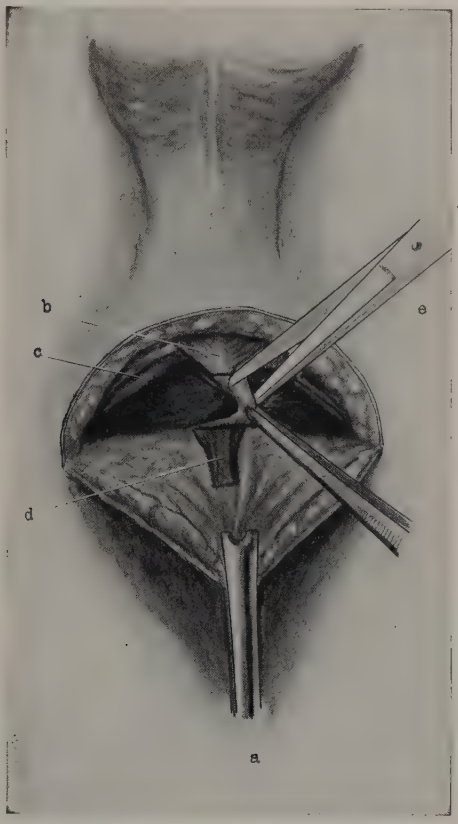

Fig. 5166.—Prostatotomy by Curved Perineal Incision for Evacuation of Pus – I; – Exposing the prostate: – a, Convex perineal flap turned downward; – b, bulb of urethra covered by accelerator urinæ muscles; – c, transverse perineal muscles; – d, severed external sphincter muscle; – cutting recto-urethral muscle (anterior fibers of levator ani). (Figs. 5166 and 5167 modified from Legueu.)

If the abscess be intraprostatic, one reaches the posterior surface of the prostate without encountering pus – and enters the pus cavity by making an exposed-to-view stab incision into one or the other lobe of the prostate gland, under direct vision (Fig. 5167). If the knife point have entered an abscess, pus usually at once flows. A finger should be carried into the cavity to examine its walls, break down septa, and estimate the possible presence of an abscess in the opposite lateral lobe or middle lobe. It is often wise to make an exploratory puncture or exploratory incision into the opposite lobe – whether or not pus be found in the first lobe, but especially if it have not been.

If the abscess be periprostatic, pus will usually have made itself manifest before the prostate gland is reached _ by breaking into the wound usually at the point that the separation between the prostate and rectum is begun.

If the abscess be situated above the prostate gland, the freeing of the posterosuperior aspect of the gland by blunt dissection is carred on as well as possible _ though the freeing, at this level, in inflammatory conditions is more difficult than those just described.

Especial care is exercised not to tear or cut into the rectum.

Having satisfied one's self that all septa in either intra- or periprostatic abscesses are broken down, in common with each other _ or that any dis-

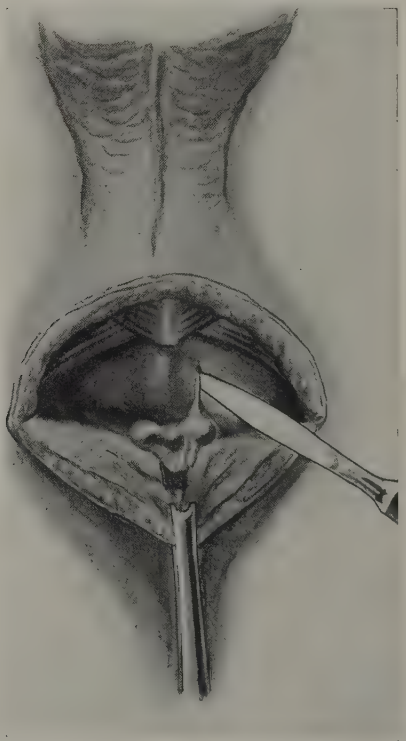

Fig. 5167.—The Same _ II; _ Incising prostatic abscess; _ knife entering pus collection in left lateral lobe.

connected abscess has been discovered and opened up _ a large rubber drainage-tube is inserted into the bottom of the cavity for about ten days, and anchored at the margin of the perineal skin. The perineal wound may be additionally drained, temporarily, by a small cigarette drain at each end of the transverse perineal wound.

The divided deep perineal structures are at the end of the operation repaired by buried catgut sutures, as well as non-interference with drainage will permit.

If the urethral tract have been opened up, it will be necessary to make provision for passage of urine by the perineum temporarily _ or for partial urinary leakage by the perineum.

PROSTATECTOMY, PARTIAL AND COMPLETE, IN GENERAL

The most frequent conditon for which the prostate is removed is hypertrophy or, better, hyperplasia – which may be of either the adenomatous or fibro-adenomatous type (more usually) – or of the fibromyomatous type. Prostatectomy is also demanded in malignancy – in which condition the removal is of the most radical nature.

Marked enlargement of the prostate in a person advancing in years, and in whom residual urine must be frequently removed by catheter – provided the growth be considered enucleable, and there be no contraindication in the patient's general condition – constitute indications for removal of

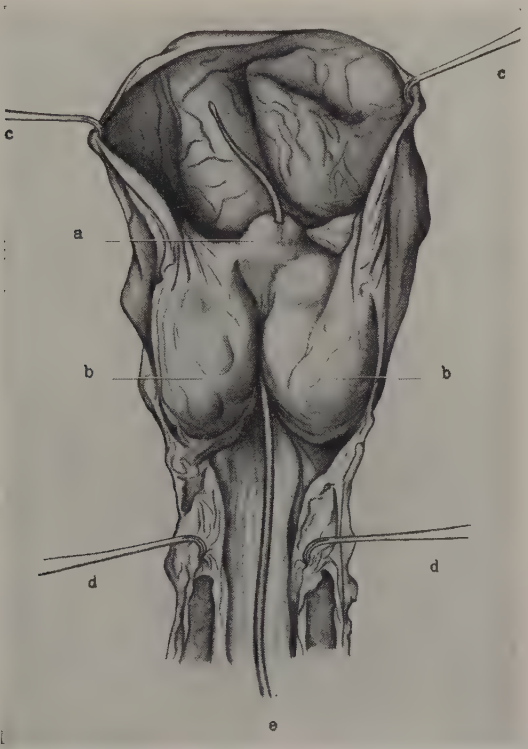

Fig. 5168.—Total Prostatic Hypertrophy Seen From Within the Bladder: – a, Middle lobe; – b, b, lateral lobes; – c, c, retractors of bladder wall; – e, bougie passing through urethra into bladder. (Modified from Albarran.)

the gland. And it is to be stressed – that operation should be performed before serious complications occur (such as chronic or recurrent cystitis, ascending pyelitis, calculi, and the like) – and while his resistance is such as to give him the maximum chance to profit from the operation. Prostatectomy performed in otherwise sound health – a grave proceding at best – is a very different undertaking under the reverse conditions.

The warranty for prostatectomy should be decided only after very careful investigation by rectal and suprapubic examinations – by cystoscopy and urethroscopy – by tests as to residual urine – and by general physical examination.

Apart from the purely obstructive side of prostatic overgrowth, it is to

be remembered that adenomatous prostates, irritated by the results of their own state, plus the irritation of frequent catheterization, have an increased tendency to become malignant.

The primary object of all operations for non-malignant enlargement of the prostate is to permanently remove the cause of the obstruction to urinary outflow and satisfactory emptying of the bladder _ together with subsequent vesical control. Preservation of the ejaculatory ducts is, of course, very desirable _ but the effort to accomplish this should not be allowed to jeopardize the main object for which the operation is undertaken.

In malignancy of the prostate the operation must be radical _ and generally also involves the excision of the neck of the bladder along with the total

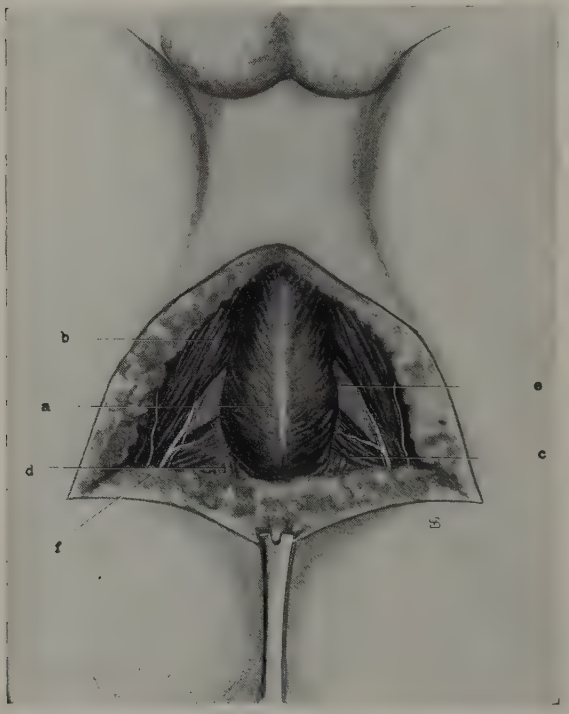

Fig. 5169.—Perineal Prostatectomy, in General _ Superficial Anatomy; _ The bow-shaped or inverted V-shaped flap, with upward convexity, has been turned downward: _ a, Bulbous portion of urethra and accelerator urinæ muscles; _ b, erector penis m.; _ c, transversus perinei m.; _ d, levator ani m.; _ e, triangular ligament; _ f, superficial perineal vessels and nerves.

removal of the prostate _ followed by the anastomosis of the remaining portion of the bladder with the membranous urethra.

In all types of procedure it is of essential importance _ bearing not only upon the success of the technical procedure, but upon life itself _ that the patient should go into the operation under best possible equipment and resistance _ that he should be spared hemorrhage and shock during the operation _ guarded from infection and wound sloughing after operation _ and that every measure should be observed during convalescence to minimize local reaction, and to promote the restoration of all physiologic functionation.

While removal of the prostate gland may be undertaken, in theory, as a total prostatectomy, the operation is nearly always, in fact, a partial pros-

tatectomy _ except in the cases of total removal of the gland, neck of the bladder, and prostatic urethra for malignancy. It has been proved that the proper or true capsule of the gland is prostatic tissue _ and therefore, unless the entire gland and the entire capsule be removed, total prostatectomy cannot be said to have been performed. It results, in consequence, that partial prostatectomy has been performed in all cases in which any true capsular tissue is left _ or nodules of prostatic tissue _ or supporting columns of prostatic tissue on each side of the urethra, as planned in several of the operations.

Prostatectomy is said to be performed extracapsularly when the gland is enucleated in the cleavage plane between the true, fibrous capsule of the

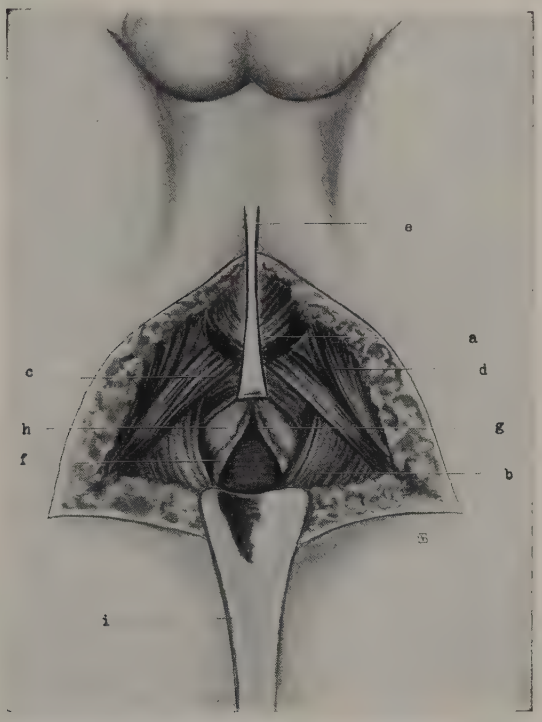

Fig. 5170.—Perineal Prostatectomy, in General _ Deep Anatomy; _ The deeper layers of the perineal wound: _ a, Bulb; b, levator ani m.; _ c, transversus perinei m.; _ d, erector penis m.; _ e, retractor of prostate gland; _ f, postero-inferior aspect of the base of bladder; _ g, vas deferens; _ h, vesicula seminalis; _ i, retractor of rectum.

gland and the connective-tissue sheath of the gland _ and intracapsularly when the prostatic glandular tissue is removed from the inner lining of the true capsule. It is exceedingly difficult _ or impossible, as held by some _ to remove the entire gland from the proper capsule _ considerable lacerated prostatic tissue generally remaining connected with the capsule.

The operations performed for prostatic enlargement may be placed in two main groups, _ radical and palliative (or, probably better, more radical and less radical procedures): _ (*a*) Under Radical Operations come _ Suprapubic Prostatectomy _ Perineal Prostatectomy _ Combined Suprapubic and Perineal Prostatectomy _ Total Prostatectomy, followed by vesico-urethral anastomosis for malignancy; _ and (*b*) Under Palliative Operations (or, at

least, less radical measures) come such procedures as _ Young's punch operation _ Bottini's galvanocautery prostatotomy _ and the like.

There is a greater tendency to recognize the special indications for and limitations of the palliative operations. and also for the radical operation of total prostatectomy in malignancy. Their fields may be said to be now less in controversy.

But as to the greater desirability of suprapubic prostatectomy, or perineal prostatectomy, there is considerable bias and much contention _ with undoubtedly a great deal of genuine inability to fairly judge as to their individual merits _ both because of the lack of as definite knowledge as might be desirable, and because of the very noteworthy fact that the majority of special Operators almost always confine themselves with absolute exclusiveness or almost absolute exclusiveness to one form of technical procedure. Self-evidently, the man who is capable of passing the fairest judgment as to the relative merits of and indications for the different types of operations, would be the man who performs about as many of one type of technic as of another. Some

Fig. 5171.—Relations of the Ejaculatory Ducts to the Prostate and to the Prostatic Urethra _ seen from above and in front, after removing a section of the anterosuperior wall of the prostate. (Redrawn from Spalteholz.)

of the ardent advocates of suprapubic prostatectomy rarely if ever perform perineal prostatectomy _ and *vice versa*. The present differences of view, therefore, are quite reasonable outcomes of this status.

Unquestionably it is wiser for the Surgeon to apply to the individual case that type of operation which, in his judgment, is best suited, conjointly, to the special local pathologic condition in the case (as far as ascertainable) and to the general condition of the patient _ while fully recognizing the difficulties of definitely deciding these points in advance, especially as to the full nature of the local involvement.

It may be of interest to note that, at this point, after the Author had stopped and written a tablutated, comparative list of the claims for and against the various types of operation (suprapubic, perineal, and intra-urethral), they were found to be so contradictory _ not only as to generalizations _ but as to specific statements _ that it would not only have been useless but confusing to insert it.

It is, therefore, left to the reader to form his own conclusions, from the

description of the individual operations which follow – where more or less full statements are made as to the scope of each procedure – as to what clinical conditions may be the indication for the adoption of a particular type of operation in the individual case.

Briefly – as the intra-urethral operations (such as the Bottini galvanocautery prostatotomy and the punch operation of Young) are very generally considered either as palliative operations to be performed when one of the more major operations is, for some reason, contraindicated, or as final operations in those cases where the nature of the obstruction requires nothing more – it narrows the main controversy down to suprapubic prostatectomy and perineal prostatectomy – and, as to these two types of procedure, one should not be a routinist – but should assuredly adopt that technic which he conceives from the local and general standpoints to be best suited to the case in question. Certain it is that many special advocates of each of these two main methods

Fig. 5172.—Sagittal Sectional View of the Ejaculatory Ducts Emptying Into the Prostatic Urethra – illustrating how, in the removal of the vesicoprostatic portion of the urethra, posterior to the utriculus prostaticus, into which the ejaculatory ducts empty, these ducts may be left attached to the distal portion of the urethra remaining in the wound – especially where, as is usually the case, according to Freyer, the lateral lobes of the prostate separate along their anterior commissure in the act of the removal. (Modified from Bryant.)

of operating claim an equal saving of life – and an equally satisfactory functional result – which are the two chief methods of measuring the adequacy and desirability of an operative measure.

TOTAL EXTRACAPSULAR ENUCLEATION OF THE ENLARGED PROSTATE BY THE SUPRAPUBIC, TRANSVESICAL ROUTE

FREYER'S TECHNIC

Description.—The entire prostate gland, together with its proper capsule, is removed via the suprapubic, transvesical route – the enucleation taking place in the plane between the proper capsule and the sheath of the prostate, but without invading either the proper capsule or the substance of the prostate. While the technic is employed in both fibromyomatously and adenomatously enlarged prostates, it is especially in the former that it is particularly applicable. (See Albarran's technic, following.)

Freyer states that the two glandular bodies out of which the prostate is developed are covered by a resistant fibromuscular capsule (its true capsule), which covers the prostate gland everywhere except along its anterior and posterior commissures, where it dips inward to cover the opposite aspects of the lobes _ and that this true capsule is incapable of separation from the prostatic mass even by dissection. Overlying the proper capsule is the prostatic sheath, which is composed chiefly of rectovesical fascia, and contains the prostatic plexus of veins _ the proper capsule and the sheath being connected by numerous bands passing between the two. The enucleation takes place between the prostatic capsule and the prostatic sheath (Fig. 5173) _ the former of which he likens to the intimate inner covering and septa of the segments of an orange _ and the latter, to the outer enveloping rind of the orange. He stresses the fact that it is erroneous not to recognize these two coverings of the prostate gland _ and that it is the prostatic tissue plus its proper capsule which he removes intact and in its entirety _ leaving behind

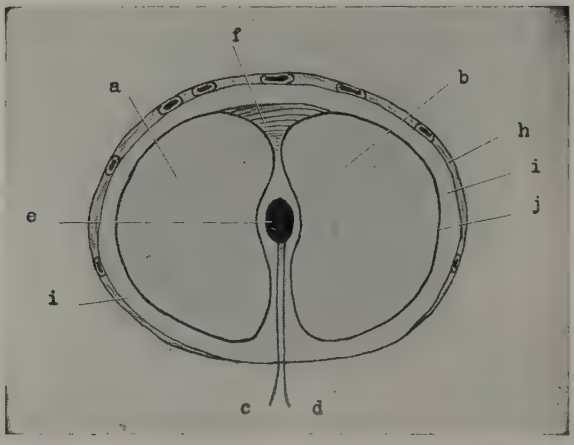

Fig. 5173.—Diagrammatic Sectional View Illustrative of Freyer's Technic in Suprapubic; Extracapsular Prostatectomy: _ a and b, Right and left lobes of the prostate; _ f, anterior commissure, _ e, urethra; _ c and d, right and left ejaculatory ducts; _ h, sheath of the prostate gland; _ j, fibrous capsule of the prostate; _ i, i, plane of separation of the gland between its fibrous capsule and sheath. (Modified from Freyer.)

the prostatic sheath, which latter prevents urinary infiltration into the pelvic connective tissue.

The urethra courses downward and forward from the bladder, passing between the inner aspects of the two lateral lobes of the prostate _ and the two ejaculatory ducts (formed by the coalescence of the ampullæ of the two vasa deferentia and the two ducti excretorii of the vesiculæ seminales) enter an interlobular depression at the posterosuperior aspect of the prostate, and, passing along the inner walls of their respective lobes, in interlobular tissue, and without piercing the prostatic capsules, finally come to lie upon the wall of the utriculus prostaticus, and empty at the colliculus seminalis.

Freyer, in his earlier operations, undertook to leave the urethra and its structures unharmed _ but subsequently discovered that equally good results were eventually obtained, whether the urethra were torn, partly removed, or a segment of it entirely removed (v. i.). While Fuller first practised this technic, it was Freyer who first made known the detailed description of the technic which chiefly established the operation.

Preparation _ Position _ Landmarks _ Anesthesia.—See Prostatectomy, Partial and Complete, in General, p. 23.

Incision.—As for median suprapubic cystotomy (v. Vol. V, p. 525).

Operation.—With the pubes shaved and disinfected _ the bladder irrigated by a somewhat stiff gum-elastic catheter, of the largest size which will pass the urethra, and which is left *in situ*, after filling the bladder with boric acid solution, median suprapubic cystotomy is performed in the usual manner (v. Vol. V, p. 525) _ through an incision of from 6.3 to 7.2 cm. (2½–3 inches), extending downward to the pubic arch. The prevesical space is exposed between the borders of the recti muscles, tying any bleeding vessels encountered on the way. Introducing the right first finger into the lower angle of this wound, the prevesical fascial tissue is displaced upward by being scraped from the surface of the bladder by the finger-nail. Along with this fascia is pushed the peritoneum _ which should remain out of sight throughout. A median incision of about 2.5 cm. (1 inch) is made through the presenting wall of the

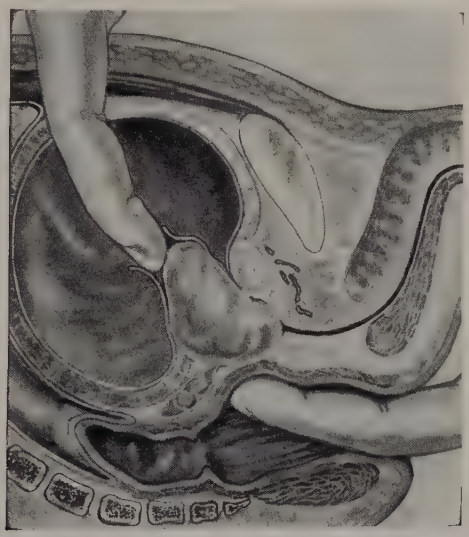

Fig. 5174.—Total Extracapsular Enucleation of the Prostate by the Suprapubic Route _ Freyer; _ Digital freeing of the prostate in the cleavage line between its true capsule and its sheath.

bladder by stab incision through a non-vascular area. If it be necessary to enlarge this opening later, it is done by separating two fingers in the wound, thus slightly tearing the ends of the incision. The interior of the bladder and the condition of the prostate are at once examined by the right forefinger introduced through the incised bladder (the margin of the bladder incision being held under control by two silk ligature tractors if necessary). If vesical calculi are encountered, these are removed. The examination of the prostate is made more satisfactory by the introduction of the left forefinger into the previously emptied rectum, whereby the gland is pushed upward into the field of examination from below and steadied during the subsequent manipulations.

The special technical enucleation is now accomplished. The vesical mucosa overlying the most prominently enlarged lobe of the prostate is now cut through by the finger-nail _ the nail being especially useful for the purpose _ after which the mucosa is detached from the underlying proper fibrous capsule of the gland (Fig. 5174). From this point onward, the finger-tip, preceded by the

finger-nail employed as a separator, closely hugs the proper capsule – first passing between it and the mucosa, and then between it and the prostatic sheath, outside of the vesical wall – traveling in the cleavage line between prostatic capsule and prostatic sheath, and following the contour of the different lobes and of the entire gland – detaching, on the inner aspects of the lateral lobes, the urethra (distended by its catheter) from the lobes, which will usually have shown a natural tendency to separate from the urethra in the site of the anterior commissure. Each lobe is thus treated in turn, including the middle lobe if present. Finally, the finger is carried downward, behind the prostate, and its inferior surface separated from the triangular ligament. The prostate, now freed from its sheath, within which it still loosely lies – and separated from the urethra – is pushed upward by the finger in the rectum, and is delivered into the bladder through the opening made in the mucosa for enucleation, and enlarged during the freeing. Occasionally the individual lobes will come away into the bladder separately. The gland, whether as a whole or in separate lobes, is then delivered through the bladder opening with forceps.

As to the ejaculatory ducts, Freyer states that when the prostatic lobes come away separately these ducts probably remain in position uninjured and connected with the urethra – but that when the prostate is removed in one entire mass they may be severed or be drawn out of the gland. But he further states – as summarizing the practical aspect of this much discussed topic – that in the considerable majority of his more recent operations the distorted part of the urethra posterior to the verumontanum has been removed, along with the prostate, the urethra being divided where the ejaculatory ducts enter it, and that the ducts generally remain adherent to the part of the prostatic urethra which is left in the wound.

As soon as the prostate has been removed the right finger is again introduced into the bladder (and the left forefinger back into the rectum, if it have been removed). The finger within the bladder then smoothes and presses and molds together the opposite walls of the cavity out of which the gland was removed, thereby aiding in the arrest of hemorrhage and in the contraction of the empty space. After this the bladder cavity is irrigated with boric acid solution, at 110° F. for two to three minutes only (as longer irrigation sometimes promotes bleeding) through the originally placed catheter.

During the act of irrigation a special type of drainage is established, the importance of which Freyer stresses. A 2.4 cm. (7/8 inch) rubber tube, with a lumen whose diameter is 1.6 cm. (5/8 inch), having two large opposite windows as near to its end as possible, is introduced through the suprapubic wounds, so that only about 2.5 cm. (1 inch) of the tube projects within the bladder – the object being, that when the bladder contracts the tube is grasped by it, so that all of the urine escapes through this tube – with minimum danger of infecting the loose connective tissue in the prevesical area. A projection of more than 2.5 cm. (1 inch) into the bladder will press upon the base of the bladder causing a sensation of constant vesical strain and of pain at the end of the penis. Any projection of the end into the prostatic wound would interfere with the contraction of its walls. The bladder wall itself is not sutured, nor are any buried sutures (which would become infected) employed. Silkworm sutures are used in closing the wound around the drainage-tube – one or two sutures passing through the opposite margins of the rectus muscle – and one suture passing into the wall of the drainage-tube to anchor it. The bladder is irrigated through the catheter before it is withdrawn. A drain of iodoform gauze is kept in one angle of the wound for twenty-four hours to keep fluids from collecting in the prevesical space. The wound

receives an outer dressing of cyanid of zinc gauze — and the body is finally surrounded in absorbent dressing, held in place by a wide binder.

After-treatment.—The dressings should be changed every four to six hours, according to their saturation. Clots of blood which may at first appear in the drainage-tube are removed with forceps. The bladder is irrigated once daily with warm boric solution or with weak solution of permanganate — by means of a nozzle carried through the drainage-tube and without the use of presssure (that the blood-clot in the prostatic wound be undisturbed). The large drainage-tube lends itself to all these ends. After lying upon his back for twenty-four hours the patient is turned, alternately, upon his sides. He should not move himself for four or five days. To control any bleeding which may occur the foot of the bed is raised, and ergotin is used hypodermically. Shock is met by heat, enemata of coffee and brandy, and by strychnin hypodermically. Pain is met by morphin. The large drainage-tube is left *in situ* for three days in thin persons, and for five days in stout individuals — by which time plastic lymph will have shut off the prevesical space from infection — after which a smaller tube is substituted, and remains in place for a few days longer. Upon its withdrawal the wound heals by granulation. The sutures are removed on the seventh or eighth day. The bladder is irrigated once daily as long as the fistula is patulous (and twice daily if infection be present) — the boric solution being thrown in by the irrigating nozzle after the drain is removed — and escapes with the withdrawal of the nozzle (unless it be passed by urethra as fast as it enters, which is sometimes the case). The irrigation may be carried on by Janet's method — but only after the first week — and only provided the patient tolerates it without discomfort — and is accomplished by introducing the nozzle of the irrigator within the urethra of the penis and then raising the reservoir until fluid flows into the bladder and out of the suprapubic wound. Catheterization has been found not to be needed to keep the prostatic urethral lumen patulous. Catheterization is only employed during the interim between the reduction of the suprapubic fistula below the size required for irrigation and the re-establishment of voluntary urination. After having previously caused the patient to have a daily movement in advance of the operation, and an enema on the morning of the operation, he is not allowed to have bowel movements for two or three days following the operation — and should then be made to move his bowels daily. An accumulation of feces in the rectum adds to the discomfort of the patient. Patients in bad condition should be especially well prepared for operation.

In the case of secondary hemorrhage the condition is to be variously met. The slight arterial bleeding which is apt to occur on withdrawing the large drainage-tube, at the end of its stay, usually spontaneously ceases upon its final withdrawal, which should be accomplished carefully and by spiral motion. If, subsequently, hemorrhage occur from spasm of the bladder, and is uncontrollable otherwise, the suprapubic wound may have to be reopened and the large drain reinserted. The same necessity may arise from the accumulation of clots within the bladder.

Comments.—The special reason for employing the finger-nail instead of a cutting instrument in the initial incision through the mucosa overlying the hypertrophied prostate is that the sharp instrument is apt to cut through both the mucosa and the proper sheath of the prostate, so that, instead of the finger getting at once into the cleavage line between capsule and sheath as it should, it is apt to flounder about inside of the capsule, making it difficult or impossible to regain its position outside of the proper capsule, so that the entire prostate and capsule may be readily removed. If the finger be within

the true capsule only isolated adenomatous tumors of prostatic tissue are apt to be removed instead of the gland intact.

Freyer has almost completely abandoned the attempt to preserve the entire urethra in performing prostatectomy — as such excellent final results have been obtained where the urethra has been partially removed. He cites that the urethra which lies behind the site at which the ejaculatory ducts enter is much more closely adherent to the prostate than is the portion of the urethra between the same site and the triangular ligament — so that while the part of the urethra between the vesical outlet and the verumontanum is apt to be torn away with the prostate, the part of the urethra in front of this site (into which the ejaculatory ducts empty) is apt to be left behind in the wound. The summary of this technic is, as he states, that if the prostate be enucleated entire in its capsule, and carefully separated digitally from the triangular ligament, the gland will be recognized to be suspended by the urethra and the ejaculatory ducts, so that one may pass the finger between the side of the urethra and the adjacent aspect of the lobe of the gland upon that side. It results from this, that if the finger be carried, medially, posterior to the prostate and above the ejaculatory ducts (that is, proximal to them), while, at the same time, the mobilized prostate be pushed upward into the bladder by the left forefinger in the rectum, the urethra is due to snap in two on a level with the verumontanum — thereby leaving, as a general rule, the ejaculatory ducts adhering to the distal portion of the prostatic urethra which remains in the wound — and therefore securing their outlets into the urethral canal.

TOTAL INTRACAPSULAR ENUCLEATION OF THE ADENOMATOUSLY ENLARGED PROSTATE BY THE SUPRAPUBIC TRANSVESICAL ROUTE

ALBARRAN'S TECHNIC

Description.—The special feature which characterizes this procedure is that the gland is removed from within its true or proper capsule. Upon this point Albarran writes, — "Contrary to the usual counsel, the pericervical incision (referring to the neck of the bladder following its exposure) is made sufficiently deep for the bistoury to penetrate into the prostatic tissue. I usually give the incision a depth of 1 cm. (6/16 inch). When the incision is too superficial it is often difficult to find the plane of cleavage. When it is deep it is easy to determine, in introducing the finger, in what plane one should decorticate (free the gland)." One will thus see the fundamental variation in the technics of Albarran and Freyer — and that what one seeks to accomplish, the other seeks to avoid — Albarran freeing the prostate inside of the true capsule in the plane between its hypertrophied and normal prostatic tissue — and Freyer freeing it outside of the true capsule in the cleavage line between the true capsule and the sheath.

Concerning the methods of removing the hypertrophied prostate and the preservation or injury of the ejaculatory ducts, Albarran makes the following observations:

When the hypertrophied prostate presents a pure adenomatous structure, decortication of the gland takes place between its proper tissue and the aponeurotic sheath which surrounds it (". . . entre son tissu propre et la loge aponevrotique qui la contient"). This would seem to mean that the separation occurs between the proper capsule and the connective-tissue sheath.

When — and this, he states, is much the more frequent — the prostate presents a fibro-adenomatous structure, with spheroidal bodies, the plane of cleavage is found between the hypertrophied prostatic mass and the glandu-

lar tissue, which (latter) still remains at the periphery, flattened out between the prostatic tumor and the aponeurotic capsule ("la capsule aponevrotique") _ which latter designation would seem to be equivalent to the proper capsule of the prostate (rather than the connective-tissue sheath _ (Fig. 5175).

In both forms of hypertrophy he continues _ contrary to the views of Freyer ("contrairement à ce que soutient Freyer") _ the prostate is not removed in its totality. In passing in the middle line, from the bladder toward the urethra, the finger does not pass in front of the ejaculatory canals, and does not go beyond the point of urethral opening. That portion of the prostate which lies underneath and behind these canals remains in place.

That portion of the urethra between the neck of the bladder and the *verumontanum* is more or less completely removed with the prostate _ according to the method of decortication:

When one follows completely the contour of the prostate, as the finger traces its external surface, the entire prostatic urethra is removed with the

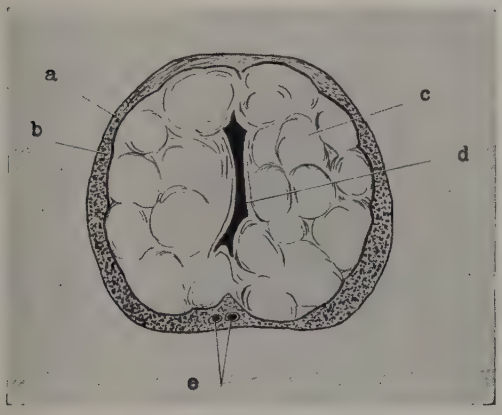

Fig. 5175.—Transverse Diagrammatic Section of a Fibro-adenomatously Hypertrophied Prostate: a, True capsule of prostate; _ b, non-adenomatous portion of the prostate, compressed between the tumor (adenomatous portion) and the proper capsule; _ c, adenomatous (hypertrophied) portion; _ d, urethra; _ e, ejaculatory ducts. Enucleation is made between b and c. (Redrawn from Albarran.)

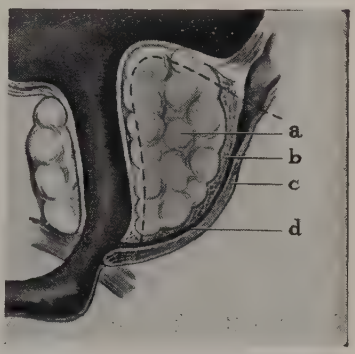

Fig. 5176.—Sagittal Diagrammatic Section of a Fibro-adenomatously Enlarged Prostate: _ a, Adenomatous portion; _ b, non-altered portion of the prostate; _ c, retrospermatic part of prostate, non-hypertrophied; _ d, ejaculatory duct. Enucleation is made between a and b. (Redrawn from Albarran.)

gland _ the mass taken away having the outline of a pear at its large anterior aspect, traversed by a canal which includes the mucous orifice of the neck of the bladder and the prostatic urethra, torn away at the edge of the *verumontanum*, behind its union with the membranous urethra (Fig. 5176).

When one tears the urethra at the union of its anterior and lateral walls the urethra is left open in front, in the form of a horsehoe, the concavity of which is covered with the urethral mucosa. The prostatic urethra is removed except for a strip of its upper wall.

Preparation.—The bladder is preliminarily irrigated with antiseptic solution and distended with air. A soft-rubber catheter is left in position, the end of which is clamped.

Position.—The patient is placed upon his back upon a table whose end is slightly elevated _ so as better to expose the neck of the bladder.

Landmarks.—Median suprapubic line _ approximate position of peritoneal reflection _ contour of prostate, as felt through the rectum.

Anesthesia.—Ether is generally used.

Incision.—Begins 1 cm. (3/16 inch) above the symphysis, and extends toward the umbilicus for about 6 or 8 cm. ($2\frac{2}{16}$ or $3\frac{3}{16}$ inches) in the median line.

Operation.—The early steps are the same as those of median suprapubic cystotomy (v. Vol. V, p. 525). The peritoneal reflection, after separating the inner margins of the recti muscles and incising the prevesical areolar tissue, is carefully displaced upward out of harm's way – but the perivesical planes are opened up as little as possible, so as to be saved from infection from the over-

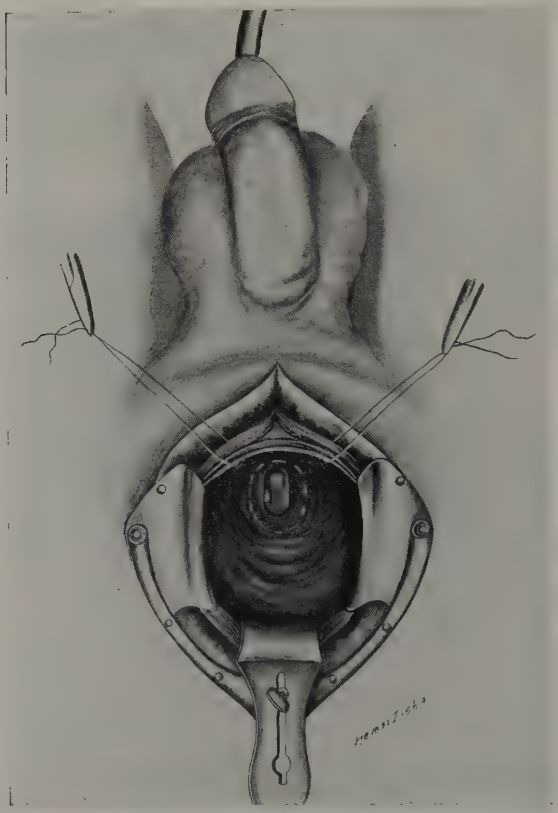

Fig. 5177.—Suprapubic Intracapsular Prostatectomy – Albarran – I; – The lips of the suprapubic bladder wound are held apart by automatic retractor and partly by thread tractors. The vesical end of the urethral catheter is seen protruding through the bladder opening of the urethra – which is surrounded by the dotted line of the incision to be made.

flow urine which will subsequently wet them. The bladder wall being steadied, that viscus is opened in the median line by a stab incision – entering near the pubic border and cutting upward for about 5 cm. (2 inches). The margins of the incised bladder are then pierced, on each side, by a silk-loop tractor, to hold them under control, and to prevent their marginal separation from the adjacent abdominal wall. Some form of instrumental retractors are then carried into the bladder so as to hold the lateral and posterior vesical walls out of the way (Fig. 5177).

The pericervical incision is now made. On entering the bladder the

end of the rubber catheter which earlier had been introduced is caught with clamp forceps, and henceforth steadied by it, or its bladder end is drawn out of the bladder wound and tied, or clamped to the urethral end (Fig. 5178). Guided by the catheter a circular incision is made around the neck of the bladder _ quite near to the neck, where the thickness of the vesical wall is less. Should a projection of the middle lobe interfere with this incision around the lower aspect of the neck, it is seized with forceps and excised, in the act of circularly incising the mucosa. This incision, as stressed at the beginning

Fig. 5178.—The Same _ II; _ Enucleation with right index-finger within the bladder _ while the left index-finger, within the rectum, pushes the gland upward into better reach of the intravesical finger. The ends of the rubber catheter are held by a clamp.

of this description, should, in Albarran's technic, pass through the proper capsule and into the tissue of the prostate for a depth of about 1 cm. (6/16 inch) _ so, as he claims, there will be no difficulty in finding the plane of cleavage by means of a finger introduced through the wound in the prostate.

The Surgeon introduces his gloved left index into the rectum _ and pushes the prostate upward into the bladder, as it were (Fig. 5179) _ so that it will be steadied within easier intravesical reach. The uncovered right index (the right hand not being gloved) is carried into the bladder, and down to the

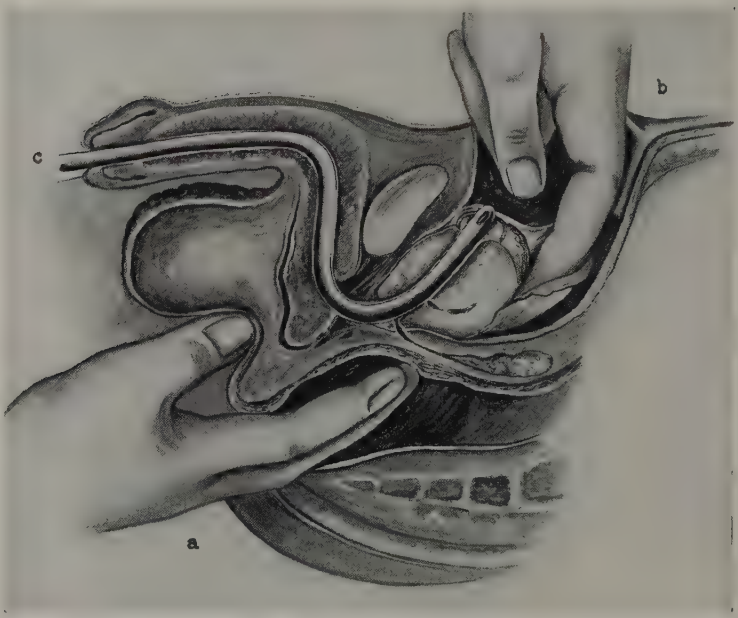

Fig. 5179.—The Same – III; – Cross-section of combined manipulation: – a, Finger or fingers in rectum, pressing the prostate upward into reach of and steadying it against the intravesical finger or fingers of the opposite hand; – b, finger within the bladder accomplishing enucleation of the lobes of the gland; – c, catheter entering bladder.

Fig. 5180.—The Same – IV; – View of the interior of the base of the bladder: – The finger is in the act of enucleating the gland through the circular incision made around the internal urinary meatus.

Fig. 5181.—The Same – V; – Intravesical enucleation of the prostate by blunt finger dissection from within the urethra outward.

circular incision around its neck (v. Fig. 5179, *b*) _ and there proceeds to insinuate its tip between the lips of the circular wound upon one side or another. Passing beyond the incised vesical mucosa _ most frequently between the still sound pressed back portion of the prostatic gland, and the hypertrophied portion (v. Fig. 5179), the finger proceeds to separate the hypertrophied portion of the gland (Fig. 5180). The separation is carried on first upon one side of the gland, then behind, then upon the opposite side, and, passing in front of the urethra, finally reaches the point of beginning. In front the decortication is carried on until one feels the enlarged anterior extremities of the lobes, and then continues to free them on outer and inner sides, and from in front backward _ until the urethra is reached, whose wall often yields to the finger.

If difficulty be experienced in first finding the proper line of cleavage between normal and diseased prostatic tissue, it is better to try to find it

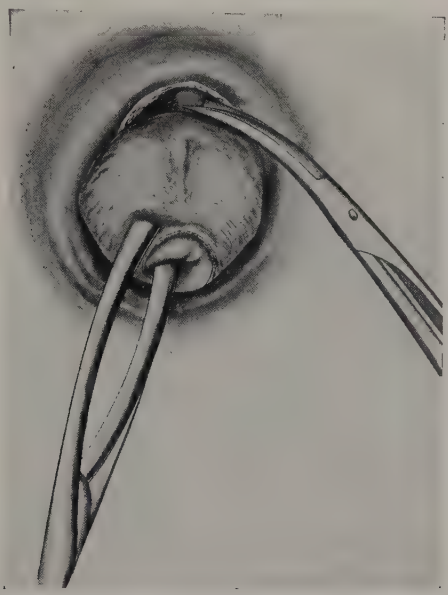

Fig. 5182.—The Same _ VI; _ When, in enucleation, extensive destruction of the urethra is involved, one may divide the urethra entirely across transversely at the site of damage or at the face of the prostate _ by means of curved scissors introduced from within the bladder.

through another part of the incision encircling the neck of the bladder _ and then finally get into the proper line of cleavage at the point where one first failed. Thus the finger sweeps completely around the prostate, so that it may be mobilized entire, traversed by the urethral canal.

The gland can generally be removed, leaving more or less intact the superior wall of the urethra. When the decortication has been completed upon the external aspects of the lobes a finger is introduced into the urethra (Fig. 5181) and ruptures the urethral mucosa from within outward, thus completing the decortication of the anterior aspect of the lateral lobes. The lobes usually come away in the form of a crescent, with forward concavity and united posteriorly.

When the entire outer surface of the prostate has been freed, the gland is then only held by the urethra, which traverses it and is continuous with

the membranous urethra in front. Or, in the case of a considerably enlarged prostate, the walls of the urethra, thinned by stretching, may easily tear – especially the lateral and superior walls – the less distended inferior wall resisting better. As a result, when in the act of decorticating a largely hypertrophied gland the finger reaches the anterior part of the prostate, it may be felt to penetrate (tear) into the urethral lumen – and if one continues to draw the decorticated gland toward the bladder with any force, the still intact posterior urethral wall is apt to be torn. The urethral tear proceeds along the inferior wall, generally a little nearer the bladder than the site of opening of

Fig. 5183.—Suprapubic, Transvesicular Prostatectomy – Legueu: – a, a, Retractors of the abdominal wall and bladder wound; – b, protruding inner end of a urethral catheter; – c, finger enucleating the prostate through a semicircular incision in the floor of the bladder about the internal urinary meatus.

the ejaculatory ducts – but sometimes to the edge of their opening. If the hypertrophy of the gland be small, on the other hand, the urethral walls are not subjected to such distention and are, therefore, less friable – and if one draws the decorticated gland strongly toward the bladder the urethra will first stretch and then tend to rupture in front of the ejaculatory ducts, even at the boundary of the membranous urethra, which itself may be torn away.

When at the same time that the prostate is removed, one lifts out a portion of the urethra in front of the ejaculatory ducts, a portion or segment of the urethral canal may be seen upon the excised structure between the lateral lobes – which is more frequently merely a tongue of mucosa continuous with

the posterior wall of the urethra _ though sometimes it is a complete circular segment extending beyond the anterior plane of the lateral lobes. In order, therefore, to avoid irregularly tearing a more or less considerable portion of the urethra with the fingers it is better to divide the canal with scissors. To accomplish this when the gland has been completely mobilized, except for the urethra, the lateral vesical retractors are replaced, and the detached prostate is seized with forceps and carefully drawn into the bladder _ and then, with curved scissors, following the anterior contour of the gland, the urethra is divided on a level with the prostate (Fig. 5182). In those cases

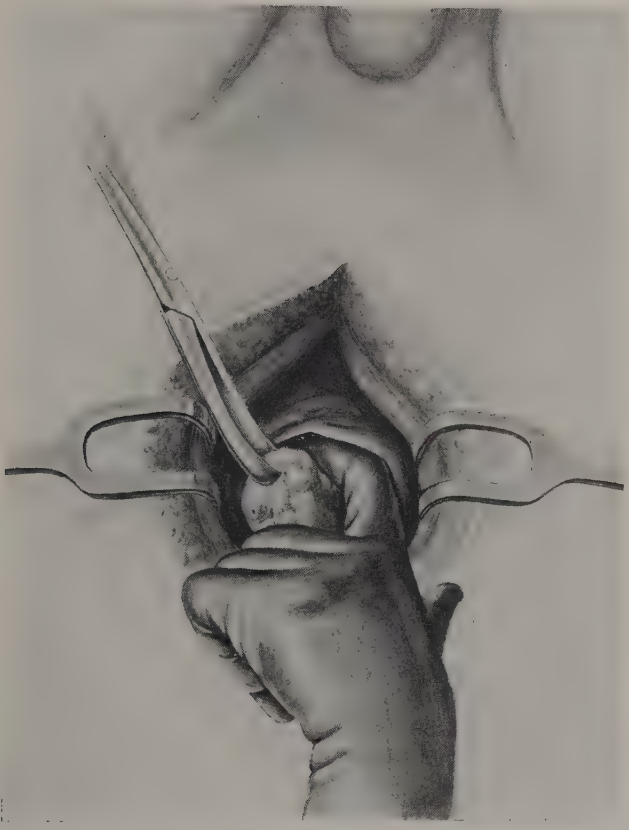

Fig. 5184.—Extravesical, Digital Enucleation of the Prostate While the Gland is Steadied by Clamp Forceps.

in which the urethra is so friable that it yields to the fingers, and readily breaks in the right place, the above maneuver is not necessary. The opening of the ejaculatory ducts upon the *verumontanum* is usually preserved.

Bleeding in the bed of the decortication can usually be controlled by hot-water irrigation through a catheter carried into the bladder through the meatus. By combined manipulation between a finger in the bladder and pressure against the perineum the walls of the prostatic wound are molded together _ which with clotting tend to prevent hemorrhage.

In concluding the operation a modification of the large rubber tube vesical drain of Freyer, with two lateral openings, is employed. The tube is

of a width of 15 mm. (10/16 inch), with a length of 10 cm. (4 inches) _ and only passes just within the bladder, and not down to the raw bed of the prostate. The outer end of the tube is brought out through the lower angle of the suprapubic wound, the excess margins of the bladder wound being closed by sutures above it down to the drain. In order to obliterate the dead space between the bladder and the abdominal wall the bladder wall is anchored to the deeper structures by two buried catgut sutures passing into but not penetrating the wall of the bladder. The margins of the abdominal wound are brought together by two silver wire sutures, embracing skin, muscles, and connective tissue of each side.

Bladder drainage is provided for by the introduction within the lumen of the large rubber drain of an elbowed glass tube, connected with a rubber tube, which is conducted into a urinal _ or the attachment above pictured is used.

Comments.—In carrying out this general technic instead of surrounding the vesical opening of the urethra at the neck of the bladder by the incision through which the decortication of the prostate is to be accomplished, Legueu and others employ a partially encircling incision, represented by one-half or three-quarters of a circle _ as shown in Fig. 5183.

The digital manipulation of enucleation may sometimes be materially aided by grasping and steadying the partially freed prostate by means of a vulsellum forceps (Fig. 5184).

SUPRAPUBIC, TRANSVESICAL PARTIAL PROSTATECTOMY IN TWO STAGES

PAUL PILCHER'S TECHNIC

Description.—In the first stage median suprapubic cystotomy is performed, with drainage of the bladder (cystostomy) _ and in the second, transvesical prostatectomy. While the operation, as worked out and endorsed by Pilcher, is a two-stage procedure, all the steps are sometimes carried out at one sitting. The special claims for the two-stage technic are the following: _ renal decompression, with minimum risk, _ complete drainage of the bladder, without urinary leakage, and relief from bed within a day, _ and prompt healing of the suprapubic wound around the site of drainage, so that, at the second stage, the prostate may be enucleated through this opening without urinary infiltration of the perivesical and prevesical connective-tissue planes. The period between operations may be delayed indefinitely _ and when the prostate is removed this may sometimes be accomplished without enlarging the suprapubic drainage opening, or through but limited enlargement _ and with less surgical shock than usual.

The following description is largely from the writings of Pilcher:

First Stage _ Median Suprapubic Cystotomy _ (performed either as the first step of the two-stage operation _ or as the preliminary step of the combined one-stage suprapubic cystotomy and transvesical prostatectomy).

Preparation.—Purgation, forty-eight hours in advance _ after which the bowels are not moved for twenty-four hours before operation. The field of operation is prepared the day in advance _ and iodin application is made upon the operating table. The patient may be quieted by sodium bromid in advance of the operation _ and by morphin, gr. $\frac{1}{4}$, and atropin, gr. $\frac{1}{150}$, a half-hour prior to operation _ or instead of the last, morphin and scopolamin by needle, in appropriate doses, is sometimes given. The bladder is irrigated just in advance of operation, and from 60 to 90 c.c. of alypin solution (5 per cent.) is thrown in through the catheter, which is then clamped or tied.

Position.—The patient is in dorsal decubitus _ or may be placed in the Trendelenburg position.

Analgesia.—Novocain infiltration (1 : 400 solution) is made into the skin, prevesical tissues, and bladder wall (held forward by toothed forceps) as encountered.

Landmarks.—Symphysis pubis _ median line _ approximate position of peritoneal reflection.

Incision.—In the median suprapubic line _ beginning about 2.5 cm. (1 inch) above the symphysis, and extending upward, toward the umbilicus, for about 10 cm. (4 inches).

Operation.—The skin and fascia are divided and the interrectal line opened up by knife _ after which the recti are separated digitally _ and the prevesical areolar tissue separated. The bladder is now distended by normal saline through the catheter. With a gauze-covered finger the presenting wall of the now distended bladder is cleared of its covering connective tissues _ at the same time pushing the peritoneal reflection upward,

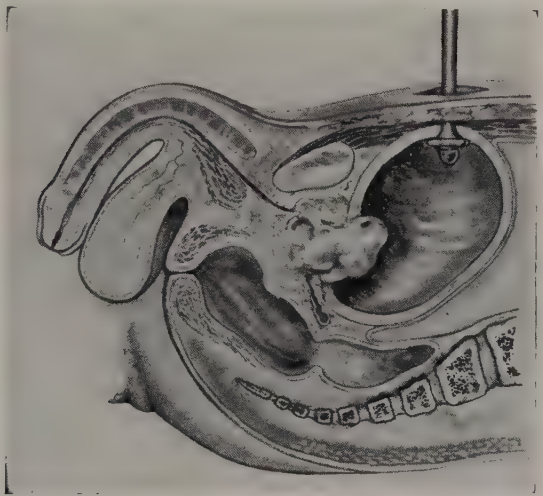

Fig. 5185.—The Same _ II; _ The Pilcher button drain of the bladder _ employed after the first stage _ and as soon as the temporarily used hemostatic bag is removed in the second stage.

out of the way of harm, where it is held under retraction. If the peritoneum be wounded in this maneuver, it is sutured before proceeding. With the sides of the abdominal wound retracted as well as its upper angle, two parallel, non-pentrating, axially running traction sutures are placed in the wall of the bladder, each being about 1.3 cm. ($\frac{1}{2}$ inch) outside of the median line. The intravesical fluid is now allowed to escape _ and while drawing the bladder wall upward and steadying it, a controlled stab incision is made into the now empty bladder, exactly in the median, axial line, parallel with and midway between the stay sutures, the position of the opening being toward the upper portion of the exposed bladder, near to the peritoneal reflection (its position, removed from the urethral orifice, being important) _ and cuts an opening large enough for the insertion of the finger in the withdrawal of the blade. The finger is then inserted and examines the interior of the bladder _ and learns the condition of the prostate for future use _ and removes, by aid of a scoop, any calculi which may be found. A de Pezzer catheter, or Pilcher's button catheter, a modification, is then at once introduced through the blad-

der incision into the bladder cavity _ and is held in place by a chromic catgut purse-string suture, or by using the traction sutures to approximate the vesical lips about it (Fig. 5185).

The prevesical space is closed by buried catgut suture so as to obliterate the dead space between the symphysis pubis, prevesical fascia, and bladder wall _ after which the abdominal muscles and aponeuroses are sutured together with buried chromic catgut stitches both above and below the drainage-tube _ but so disposed as to force the drain to make its exit high up in the abdominal wound _ the muscle suturing coming comparatively near but not into immediate contact with the tube. Finally the skin margins are sutured with interrupted silk stitches. The tube is held in contact with the skin, at its exit, by strips of zinc-oxid plaster _ after which the urethral catheter is withdrawn _ and the wound dressed.

Interval Period.—The clamped or stoppered bladder drain is released as soon as the patient reaches his room, so that the bladder may be emptied. And, subsequently, if the amount of residual urine be small, continuous drainage may be employed. But if there have been bladder distention of considerable degree or duration, opening of the drain every hour or two is preferable. During the period of maximum reaction from the operation, up to the fourth or fifth day, no irrigation or medication of the bladder is instituted.

Primary union almost always follows, even in cases of bladder infection _ due to elimination by the method of suturing of both perivesical and prevesical spaces. A cystostomy opening is established by the button drain _ which fits tightly around the vesical drain and prevents leakage.

The length of time between the preliminary and major operations will be determined by circumstances.

Second Stage _ Transvesical Prostatectomy.—The technic of this stage is the same _ whether performed immediately following the first stage at the same sitting _ or after an indefinite period.

Preparation.—This is, practically, the same as for the first stage. The vesical sinus is especially well cleansed.

Position.—In the dorsal posture _ with access to the rectum.

Anesthesia.—Ether by the drop method for general effect. Anoci-association for local blocking is also employed (after entering the bladder) in conjunction with anesthesia, as described in the first stage. Guided by a finger in the suprapubic opening a long needle is carried down to the prostate, which is then infiltrated with novocain solution.

Landmarks.—The suprapubic opening _ the known anatomy of the prostate and surrounding structures.

Operation.—The initial steps will differ according to the length of time which may have intervened between the first and second stages. If the second operation be within one or two weeks, the drainage opening will usually be sufficient for approach to the bladder, and need not be enlarged _ and the silk skin sutures will still be in position, and should not be removed, as they are needed to strengthen the wound against tearing under manipulation. If these original skin sutures have cut through, other stout silk sutures are placed through the skin to strengthen the comparatively fresh suture line during the second step. If considerable time have elapsed the wound will have largely solidified, and the drainage opening will probably have shrunken considerably _ in which event it will be necessary to enlarge the opening.

The narrowed vesical sinus is increased by means of two lateral incisions, and one median, toward the symphysis _ each about 2.5 cm. (1 inch) in length. These incisions extend only through the skin and fascia, down to, but not through, the rectal aponeuroses. The object of these incisions, which

do not expose the prevesical space, is simply to furnish approach to and entry into the bladder — and to enable the finger to make the reach from the abdominal opening to the prostate (which would otherwise be difficult in a thick-walled abdomen).

The enucleation of the prostate is now begun. The right index-finger is carried into the vesical orifice of the urethra (two fingers, if it be possible to do so, and one will not suffice under difficult conditions) — and, after digitally stretching the urethral orifice, the band-like sphincter of the bladder is sought — and effort made to separate the prostate gland from this circular sphincter by breaking into the cleavage line naturally existing between the hypertrophied glandular masses and the muscle bundles. The special object of preserving the internal vesical sphincter is that its contracting action will first aid in controlling hemorrhage after enucleation — and subsequently help to secure better and speedier urinary control. The separation just described is more difficult in proportion as muscular or fibrous hyperplasia is present. Pilcher stresses that all prostatic tissue should be removed from the sphincter muscle.

If one or two fingers of the left hand be carried into the rectum the prostate may be so pushed up into the bladder as to greatly aid in the freeing of the gland. With the structure thus elevated and steadied, the Surgeon's right index enters the urethra until the far end of the prostate is reached, where the cleavage lines are sought and opened up through the line of least resistance in the mucosa (usually upon the lateral walls) — after which the finger is carried around the side and front of that lobe (the portion nearest the membranous urethra being hardest to free) — and then, crossing the urethra, carries out the same technic upon the opposite side. When the sides and prevesical aspects are cleared the finger is passed beneath and between the lobes, freeing the interlobular and rectal aspects. The portions most difficult to mobilize are at the junction of the prostatic with the membranous urethra, and the connection of the atrophied middle lobe which lies beyond the ejaculatory ducts (and which is probably only exceptionally removed). The freed prostate may be displaced into the bladder by the finger used in a hook-like manner.

The site of enucleation is wiped free of all clots, small prostatic calculi, if any, pieces of broken tissue, and the like, by means of a pledget of gauze held in a clamp.

Hemorrhage is best controlled by hot-water douching — by the replacing of adjacent lacerated tissues into as nearly normal position as possible, and by molding the parts into apposition over the site of enucleation — and by the promotion of the covering of the raw surfaces by blood-clots (which should be undisturbed) — and by the contraction of the structures.

In those cases in which it is indicated to mechanically control bleeding the Pilcher hemostatic bag is employed — seen in position in Fig. 5186. Its introduction is accomplished in the following manner: — A well curved silver catheter is carried through the meato-urethral canal, carefully through the site of enucleation, into the bladder, and out of the suprapubic wound — whereupon the urethral tube of the hemostat is slipped over the end of the catheter and firmly tied with silk — after which the catheter is withdrawn, bringing the rubber urethral tube (which is also a urinary drain) after it, through the urethra — and, along with it, the empty, pear-shaped rubber bag is drawn, little end foremost, guided by a finger in the bladder, down upon the site of enucleation — the ragged edges of which have all been folded inward upon the raw surfaces in advance of the bag. The bag is held in place by attaching the urethral tube to the thigh and leg by strips of zinc-oxid plaster. The inflation

tube is brought out of the suprapubic wound _ and, through it, the bag is inflated _ and the tube clamped.

The hemostatic bag is kept under considerable tension (by the adhesive strips) for the first hour _ after which the adhesive strips are cut and the bag is deflated, but is left *in situ*, in event that its further use be needed. The bag is eventually removed through the suprapubic wound by means of the air-tube in from twenty-four to forty-eight hours _ serving during this time also as a urethral drain of the bladder.

The bladder itself is always independently drained _ by means of a short rubber tube, about 2.5 cm. (1 inch) in diameter, and which passes only 1.3 cm. ($\frac{1}{2}$ inch) into the bladder and is anchored to the skin. A tapering glass connection piece is attached to the large bladder drain _ and to its smaller end a piece of rubber tubing, which is conducted thence to a urinal.

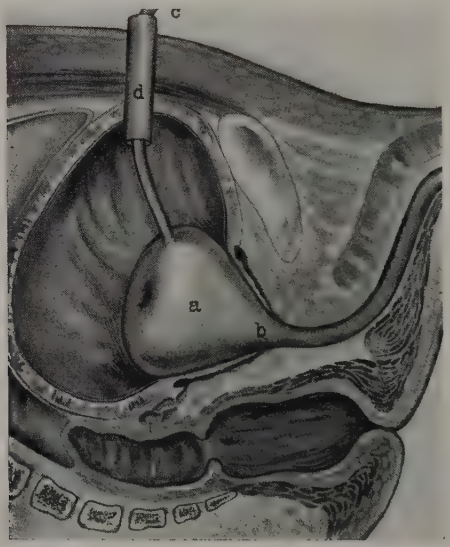

Fig. 5186.—The Same _ VII; _ The Pilcher hemostatic vesical bag-drain in position: _ **a**, The pear-shaped, inflatable bag; _ **b**, urethral drain _ its ends emerging at the meatus and at the base of the bag; _ **c**, the inflating tube. The latter tube is seen emerging from the suprapubic wound within a large, short vesical drain, **d** (to which a glass connection will attach a rubber tube, leading to a urinal). The urethral drain is anchored to the thigh by strips of adhesive plaster, and then passes into a urinal.

The hemostatic bag is removed by means of its air-tube at the end of forty-eight hours _ and at the same time the large bladder drain is taken out _ both being carefully drawn through the suprapubic wound. Immediately upon the withdrawal of these a Pilcher button catheter or a de Pezzer catheter replaces the large bladder drain _ and is introduced by being grasped by long-limbed forceps, which carry it, compressed, into the bladder along a narrow retractor which holds open the suprapubic wound. The bladder usually soon contracts about this and holds it in position. This special catheter should be tested with fluid to see that it drains _ after which it is connected with a urinal by an extension tube.

The majority of patients get out of bed within two or three days _ and are kept dry by their drain. In some cases there is bladder leakage along the drain. At the end of a week patients generally begin to get bladder control _ beginning by clamping the drain, until the bladder fills somewhat, and then trying

to urinate, usually with increasing success. The drainage-tube is then removed. The suprapubic leakage which at first follows generally ceases within two or three days. The vesical sinus is usually entirely healed within two weeks.

PARTIAL PROSTATECTOMY BY THE PERINEAL ROUTE

YOUNG'S OPERATION

Description.—The features which especially characterize the Young operation are the following: _ The approach through an inverted V-shaped perineal incision _ the exposure of the membranous urethra through the aid of a bifid retractor (Fig. 5187) _ the forward traction of the prostate gland into the field by means of a special prostatic tractor (Fig. 5188), introduced

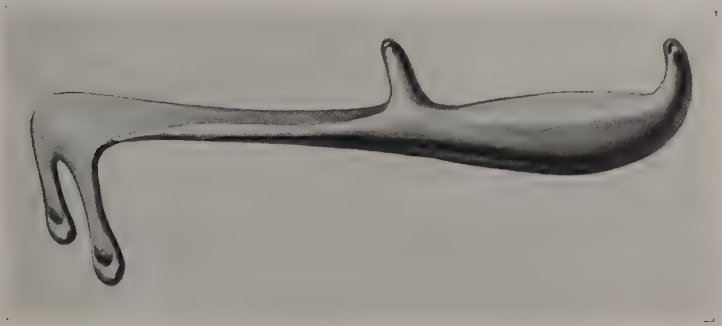

Fig. 5187.—Young's Bifid Prostatic Retractor.

through an incision in the membranous urethra _ the enucleation of most of the prostatic tissue through two parallel incisions, placed outside of and embracing the prostatic urethra, thereby planning to leave, *in situ*, a central wedge, 1.5 cm. (10/16 inch) deep, composed of the prostate, and preserving the prostatic urethra and the ejaculatory ducts, intact within its substance _

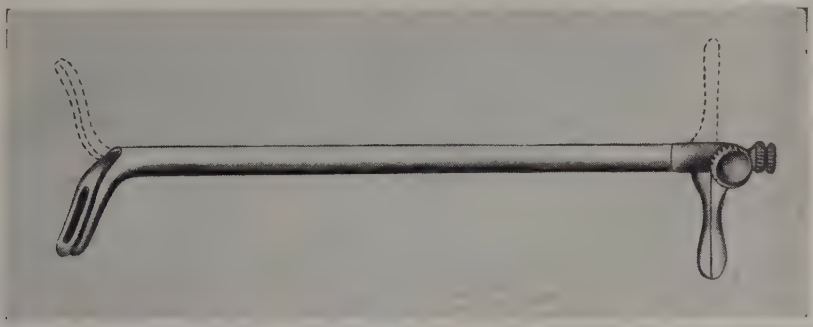

Fig. 5188.—Young's Prostatic Tractor, With Blades Closed, for Introduction _ and with dotted outlines of the blades when opened for traction.

special traction forceps (Fig. 5189) _ and special sharp and blunt prostatic dissectors. Lichtenstern's prostatic dissector is seen in Fig. 5190. Young's description of the technic is here largely followed in the partial and complete operations.

See Prostatectomy, Partial and Complete, in General, p. 23.

Preparation.—Bowels emptied. Bladder irrigated. Perineum shaved and disinfected. A No. 24 F. sound is passed into the posterior urethra

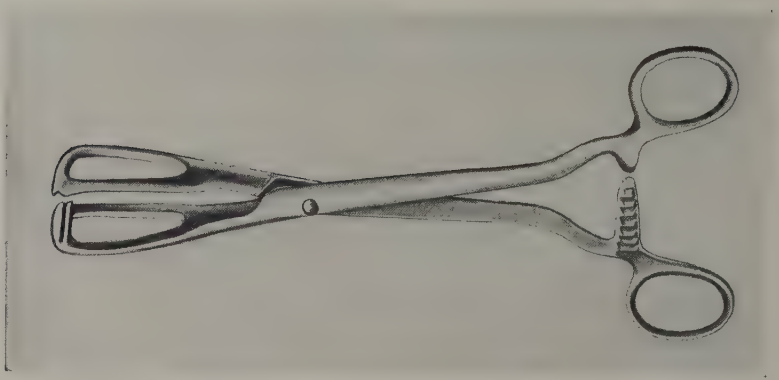

Fig. 5189.—Young's Prostatic Forceps.

Fig. 5190.—Lichtenstern's Prostatic Enucleator.

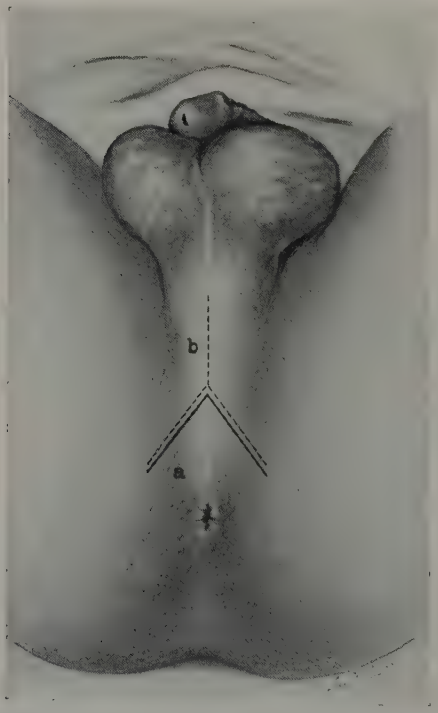

Fig. 5191.—Partial Prostatectomy by the Perineal Route. I: a, Exposure by inverted V-shaped incision (solid); b, exposure by inverted Y-shaped incision (dotted).

when the patient is recumbent, and before being placed in the lithotomy position.

Landmarks.—Perineoscrotal junction _ anus _ median perineal raphé _ ischial tuberosities _ known relations of the prostate gland, ejaculatory ducts, urethral tract, and deep perineal structures.

Anesthesia.—Ether is usually employed.

Position.—The exaggerated dorsal (lithotomy) posture _ with the perineum elevated until nearly horizontal. This makes it possible to secure satisfactory

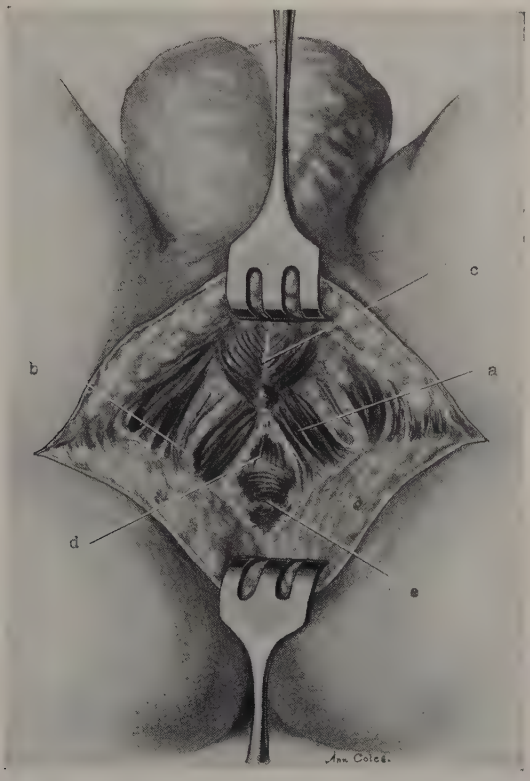

Fig. 5192.—Transverse or Lateral Perineal Section _ Exhibiting the Superficial Perineal Anatomy; _ The exposure has been made, here, through a bow-shaped incision, with upward convexity, extending from one tuberosity to the other _ after which the margins of the perineal wound are retracted forward and backward _ somewhat displacing the underlying structures: _ **a,** Superficial transverse perineal muscle; _ **b,** ischiocavernous muscle; _ **c,** bulbocavernous muscle; _ **d,** rectum; _ **e,** inferior portion of the bulborectalis and sphincter ani.

retraction of the rectum, and fuller exposure of the posterior aspect of the prostate.

Incision.—This is usually in the form of an inverted V, that is, tent shaped (Fig. 5191, **a**), the apex lying over the posterior aspect of the bulb (approximately 5 cm., or 2 inches) anterior to the anus _ and the lateral limbs, each about 5 cm. (2 inches), extending backward and outward, over the ischiorectal spaces, parallel with the ischiopubic rami.

If more room be required for a fuller exposure, especially in a thick perineum, a median vertical incision is extended upward from the apex of the inverted

V toward the perineoscrotal junction – thus giving to the total incision the form of an inverted Y (v. Fig. 5191, **b**).

Operation.—This incision is carried through skin and fascia by knife – after which it is deepened by blunt dissection (Fig. 5192), using the finger and a blunt dissector to expose and open up the space on each side of the central tendon of the perineum – retracting the transverse perineal muscles forward and the levatores ani backward and outward, carrying the exposure to the triangular ligament. At this stage, when these structures have been exposed, the special bifid retractor is applied, saddling the central muscle and tendon, and tensing these structures by drawing them backward (Fig. 5193). The central perineal tendon is then divided close to the bulb, but

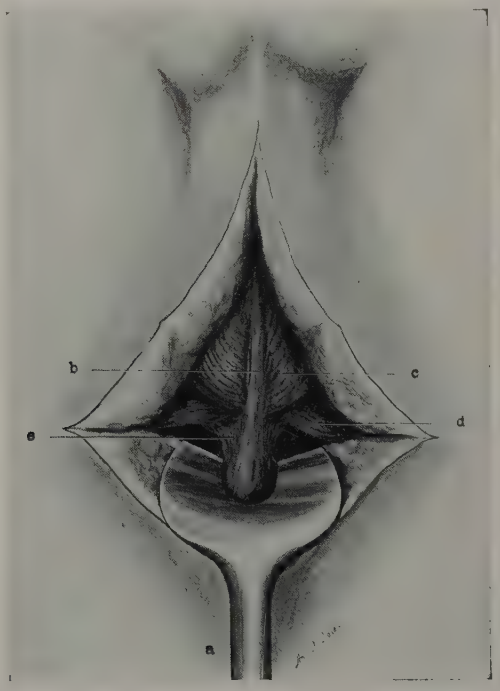

Fig. 5193.—The Same – II; – Exposure of the parts (the musculature here alone shown) in the superficial portion of the wound: – **a**, Downward retraction of perineal flap with Proust-Young special retractor; – **b**, sphincter ani m. (anobulbar raphé); – **c**, accelerator urinæ (bulbocavernosus) m.; – **d**, transversus perinei muscle; – **e**, recto-urethral muscle (anterior fibers of levator ani muscle). (Modified from Young.)

without damage to it. The bulb is then retracted forward, exposing the recto-urethral muscle, formed by the anterior median fibers of the two levator ani muscles – extending forward from the wall of the rectum and covering the membranous urethra. The rectum is retracted well backward – tending, as it does, to overlap the apex of the prostate, and sometimes even the membranous urethra. With the rectum drawn firmly backward and the muscular structures of the triangular ligament well forward the membranous urethra is brought into the field.

With the retractors drawing these parts in opposite directions, and with the sound in the urethra previously introduced brought into position, the membranous urethra is made accessible, and is incised over the sound (Fig. 5194). The margins of the urethral incision are then seized either with clamp

forceps or are controlled by thread tractors. The meato-urethral sound is withdrawn and another sound is passed, by the perineal wound, through the incised membranous urethra, into the bladder, to test the way for the tractor – after which the special tractor, with closed blades, is similarly carried into the bladder through the incised perineum and urethra – the introduction, if difficulty be experienced, being sometimes aided in the first part of the passage by turning the beak of the instrument backward – and then, on its entering the bladder, turning it forward through a half-circle (Fig. 5195). During the insertion of the instrument the lips of the urethral incision are carefully held out of the way. Young states that after the tractor has entered the prostatic urethra it is usually well to remove the anterior bulb retractor so as to allow the shaft of the tractor to be inserted further

Fig. 5194.—The Same – III; – The membranous portion of the urethra has been incised upon a sound for the introduction of the special form of intravesical tractor – and thread tractors have been inserted into the lips of the urethral incision. (Modified from Young.)

forward. When the tractor is within the bladder the blades, which are controlled by the external handle and set by a screw, are opened out in opposite directions, and at the same time brought against the posterior aspect of the prostate (Fig. 5196). After the handles are made rigid in this position – with the opened blades in the bladder lying usually in the horizontal plane (from which they may be turned into the vertical plane), as shown in Fig. 5197 – moderate, controlled traction upon the now outspread blades will tend to displace the prostate, in its entirety, both downward and forward. The recto-urethralis muscle is divided, thereby exposing the apex of the prostate gland – and to further expose the gland the fibro-areolar tissue lying posterior to the prostate (which constitutes the posterior layer of Dénonvilliers' fascia) is divided, thus opening up into the space between the two layers

of Dénonvilliers' fascia, which enables the prostate to be brought more fully into the field – and also makes it possible to displace the rectum further

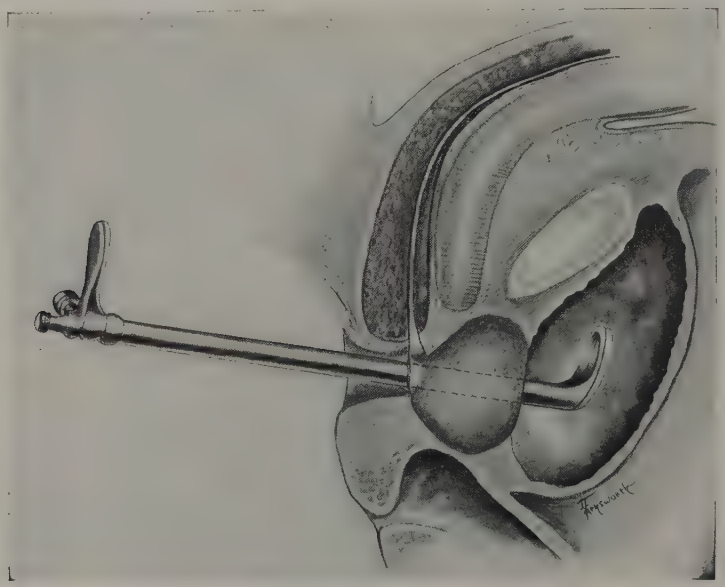

Fig. 5195.—The Same – IV; – Young's prostatic tractor entering the bladder closed.

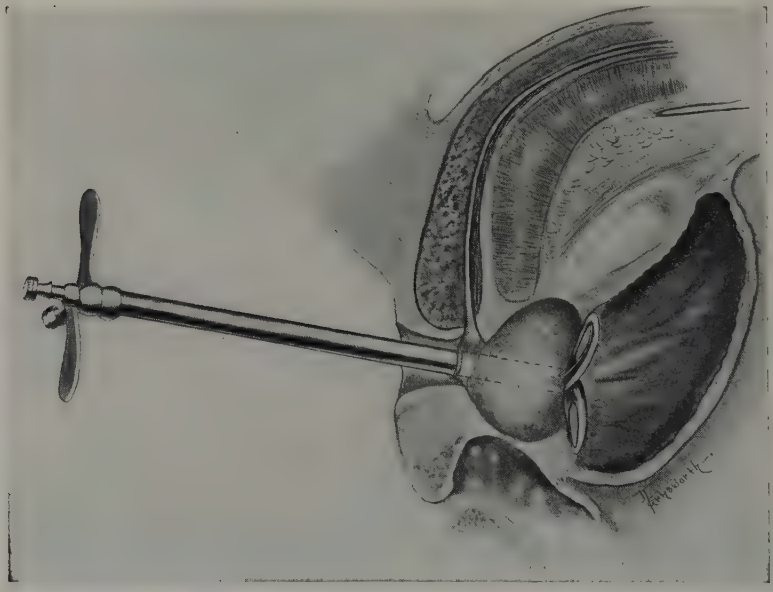

Fig. 5196.—The Same – V; – The blades of the tractor have been opened – and traction upon the handle is in the act of bringing the prostate downward and forward toward the perineum.

backward. The posterior aspect of the prostate can now be fully freed and even the seminal vesicles exposed.

Fig. 5197.—The Same—VI;—View, from within the bladder, of the action of Young's tractor—when applied transversely (solid blades)—and when applied axially (dotted blades).

Fig. 5198.—The Same—VII;—The special tractor has been introduced through the incised urethra, into the bladder, its blades separated, and the prostate brought, by traction, nearer the perineum. Two parallel lateral incisions are then made into the prostate glands, on either side of the median line.

By means of the downward and forward traction upon the prostate with the special tractor, the backward retraction of the rectum, and forward terrac-

tion of the bulb (though sometimes lateral retractors variously replace these) the prostate is made ready for the next step _ which consists in making two parallel axial incisions for about 1.5 cm. (10/16 inch) in depth through the capsule and substance of the prostate, on each side of the median line of the posterior surface of the prostate, for almost its entire length (Fig. 5198). These incisions are about 1.5 cm. (9/16 inch) apart anteriorly, and about 1.8 cm. (11/16 inch) apart posteriorly. The object of these incisions (an essential feature of Young's technic) is to leave intact a median bridge of prostatic tissue, which includes the ejaculatory ducts and the floor of the prostatic urethra. They also serve to open up the way through the prostatic tissue, to the floor of the urethra, and are the portals of entry through which

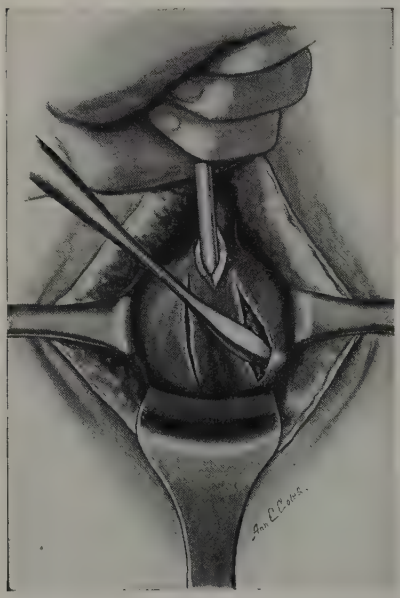

Fig. 5199.—The Same _ VIII; _ The prostate gland is steadied and brought forward by the special tractor _ while, through one of the two lateral incisions of the prostate, a blunt dissector, insinuated between gland and capsule, is beginning the enucleation of the outer aspect of the left lateral lobe.

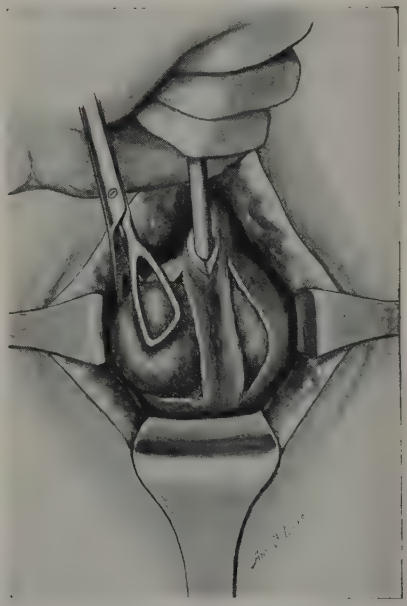

Fig. 5200.—The Same _ IX; _ Special forceps are practising traction upon the partly detached lateral lobe, while its remaining attachments are being severed _ the prostate itself being held forward, the while, by means of the tractor. (Modified from Young.)

the enucleation is accomplished, as well as of exit through which the enucleated prostatic tissue is removed.

The enucleation of the lateral lobes of the prostate is first carried out _ and is begun by means of a curved blunt dissector, separating the capsule from the gland, first upon its posterior and external aspects (Fig. 5199) _ and then by separating the lobe from the median bridge of prostatic tissue and from the urethra. As one works toward the apex of each lobe the somewhat firmer adhesions there encountered are best divided by curved Mayo scissors. This combined blunt and sharp dissection by instruments is varied at different stages by the insertion and use of the Surgeon's index-finger _ and the technic of enucleation is greatly aided by seizing, in turn, each partly detached lobe with special forceps and practising traction upon it while its

attachments are being severed (Fig. 5200). The order of the finger sweep, in completing digital enucleation, especially where adhesions are somewhat difficult to separate, is to clear the anterior surface of the prostate to the bladder _ and then to clear it laterally and internally. The detachment is further aided by traction upon the special tractor, whose separated blades within the bladder are pressing upon the vesical aspect of the prostate serving both to draw the prostate downward and to guide the Surgeon as to the relationship of the structures in the vicinity.

The median lobe is now to be removed if prominently present _ which a preliminary cystoscopic examination will have determined. This can usually be accomplished by first so rotating the blades of the intravesical tractor as to enable one of the blades to bear directly upon the median lobe, thus steadying and depressing it toward one or the other of the empty spaces left by the

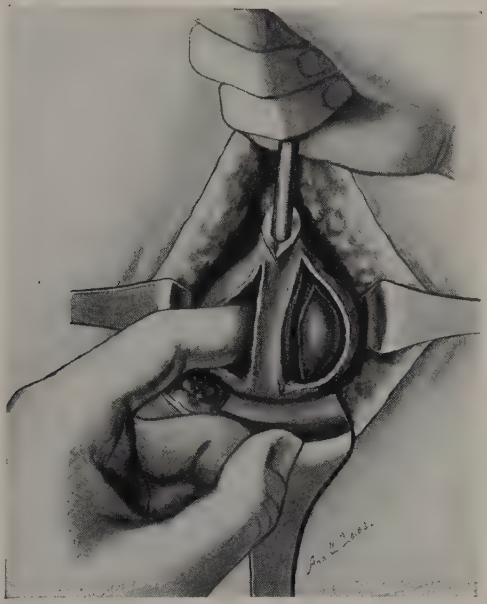

Fig. 5201.—The Same _ X; _ Digital enucleation of the middle prostatic lobe over the tractor handle and urethra, and through the spaces left by the enucleation of the lateral lobes. In the median bridge the intact ejaculatory ducts run. (Modified from Young.)

enucleation of the lateral lobes, guided by digital manipulation (Fig. 5201). When the median lobe has been brought sufficiently into the field it is seized with lobe forceps and its enucleation completed _ taking care not to injure the vesical mucosa overlying it, the ejaculatory ducts posterior to it, or the urethra in front of it. If the median lobe be more of the transverse median bar type, rather than nodular, it may not be possible to readily enucleate it with the tractor blade in the bladder _ so that it may be easier to seize this median structure with a tenaculum hook passed through one of the lateral spaces left empty by the removal of the lateral lobes (Fig. 5202). The median bar is drawn down into the lateral space and partly separated _ the separation from the ejaculatory ducts behind it and from the urethra in front of it being accomplished in order _ until, partly separated, it can be caught by a small clamp, and its final removal accomplished by combined blunt and sharp dissection.

Sometimes the urethra is limitedly torn, which is usually not serious.

At this stage a median and two lateral cavities, formerly occupied by the lobes of the prostate, are present, communicating with the perineal wound – into which also opens the incision in the membranous urethra, through which the intravesical tractor was carried into the bladder.

Before the operation may be considered completed a digital examination should be made of the neck and cavity of the bladder. As the lateral wall of the urethra has usually received a lateral linear tear in the manipulations, the finger is introduced through this, first into the urethra, and then into the bladder. If the entering finger be blocked by fibrous bands, it may have to gently bore its way through them into the bladder, or they may have to be stretched with a dilator, until they yield sufficiently. The finger first examines the vesical orifice, to ascertain whether there remains any part of

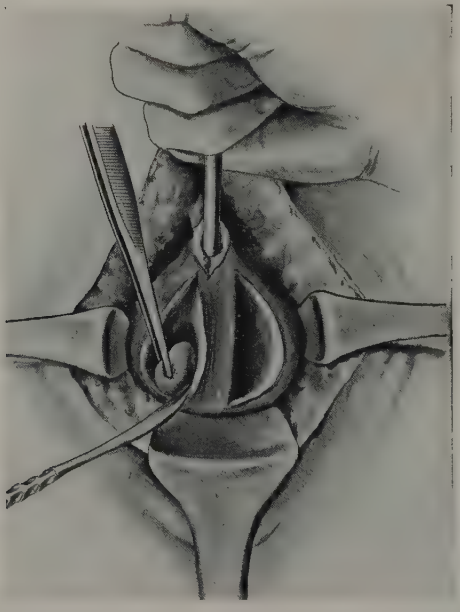

Fig. 5202.—The Same – XI; – Excising an obstructing "median bar" lobe – which is here shown being mobilized and brought down into one of the cavities left by the removal of a lateral lobe preparatory to freeing it.

the median aspect of the prostate – or any part of the lateral lobes – to block the urinary exit. Any such obstruction which may be thus encountered is brought down by finger or forceps sufficiently into the wound to be removed.

Examination of the interior of the bladder should also be made for calculi – and, if any be found, they should be removed by the introduction of calculus forceps, through the same route the examining finger had traversed. Small calculi may be removed with a scoop. If a calculus be too large for this, the lateral wall of one side of the urethra is divided, and even some of the structures at the vesical orifice may have to be limitedly incised. If it have been necessary to sever the sphincteric structures to secure the needed room for the removal of a stone, such divided structures should be subsequently sutured with catgut in completing the operation – as the parts are generally sufficiently exposed in such cases to enable this to be done.

Drainage is now provided for – the double drain tubes being first used

for the purpose of irrigating out the clots in the bladder resulting from the operative technic. For this purpose two soft-rubber catheters of large caliber are stitched together at their ends – which are also so cut, obliquely, as to make a single point for introduction – and the terminal eyes of the catheters are enlarged. This "double-barrel" drain is introduced through the prostatic urethra. A fountain-syringe is at once connected with the inlet tube – and the bladder washed out through the outlet tube. If clots block these tubes, they are "milked" out through the tubes.

Before concluding the operation a digital examination should be made to see if the rectum have been wounded – which in one's earlier operations is apt to be the case. If any laceration be found, this is at once repaired – by a deep layer of fine silk sutures and by one or two layers of reinforcing catgut sutures – applied from within the perineal wound.

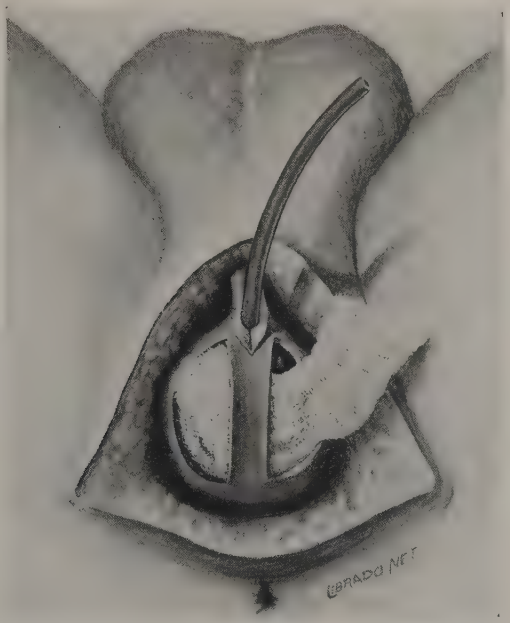

Fig. 5203.—The Same – XIII; – Two strips of gauze packing are seen marking their exit from the cavities of the lateral lobes – and the bladder drain, a rubber tube, is emerging through the incision made in the membranous urethra, earlier in the operation, for the introduction of the tractor.

Finally, each lateral cavity, formerly occupied by a lateral lobe, is packed with a 7.5 cm. (3 inches) width strip of gauze – and these two strips of gauze pack are brought out of the perineal wound by the side of the intravesical catheter drains which emerge from the urethral wound and which are stitched to the margins of the wound (Fig. 5203).

The median margins of the levator ani muscles are sutured together in front of the rectum (by a single catgut stitch, Young states) – which is an important part of the technic, to restore the support of the rectum, and to reëstablish the pelvic floor (except for the exit of the drains).

Last of all the perineal skin and superficial tissues are brought together along the original line of exposing incision – about four catgut stitches in each limb of the inverted V (or inverted Y) – leaving room at the apex of the inverted V (or at the junction of the three limbs of the Y) for the exit of the

two pieces of gauze, and the two rubber drains which are stitched to the skin.

During the act of suturing continuous drainage is kept up from the fountain-syringe, through one tube and out through the other. The irrigation is discontinued when but little blood tinging appears in the outflow — and then the tubes are clamped with the bladder partly filled with fluid — to prevent clotting.

The patient is then transferred to bed — and the irrigation, from a permanent stand, is resumed — the reservoir holding 2 gallons of saline solution, at a temperature of 125° F. — one of the two vesical drains being connected by a rubber tube with the reservoir of supply, and the other with the collecting receptacle. This constant irrigation is maintained until the outcoming fluid from the bladder shows no further in-travesical bleeding, when the inflow is made less by partially clamping the rubber tube with a clip — and is then finally discontinued after probably several hours, when no further bleeding is shown. If clotting occurs within either tube, the inflow current is reversed or suction is applied to the blocked tube.

Measures are resorted to to maintain vascular tension — against operative shock and postoperative urinary suppression — these ends being accomplished by the free use of water in advance of the operation, by the exaggerated dorsal (elevated buttock) posture during operation, and by a submammary infusion of 700 c.c. of saline upon the table — and an abundance of water to drink subsequently, as soon as it can be retained — and if it cannot, then by rectum.

The first dressing is removed at the end of eighteen hours — in advance of which the irrigation is resumed — and flows during the removal of the two strips of gauze from the cavities of the lateral lobes — and is maintained after the dressing for several hours, or until all renewed bleeding ceases.

The intravesical drains are removed, as a rule, four or five hours subsequent to the removal of the two strips of gauze, provided bleeding have ceased — and subsequent to this neither drainage nor gauze packing is used — the wound receiving simply an abundant perineal dressing — which for a few days serves to catch the urine, which escapes chiefly through the perineum — during the continuance of which the dressings are frequently changed and the wound washed with boric acid solution. The perineal suturing rarely breaks down. The wound usually heals entirely within two or three weeks.

To promote general health patients are often put upon a wheel chair on the second day — and usually walk before the end of the week. Fresh air, nourishment, and sleep greatly aid in the convalescence.

Young states that he has never seen a definite case of stricture follow this operation — and that he has never found it necessary to pass sounds after the operation.

TOTAL EXTRACAPSULAR PROSTATECTOMY BY THE PERINEAL ROUTE — ALONG WITH EXCISION OF THE BLADDER NECK, FOLLOWED BY UNION OF THE BLADDER WITH THE URETHRA

YOUNG'S OPERATION

Description.—The neck of the bladder is transversely divided just above the prostatocervical junction, and sutured to the transversely divided membranous urethra — after which the excess of incised bladder wall is sutured together in the median line. The technic is the same as that just described in the operation of partial prostatectomy, up through the introduction of the intravesical tractor — after which the neck of the bladder is circularly excised and removed *en masse* with the prostate gland, seminal vesicles, and more or less of the ampullæ (after ligating the vasa deferentia).

It will be thus seen that the radical operaion consists in the removal of the prostate gland, in its sheath, the neck of the bladder, the vesiculæ seminales, with more or less of the ampullæ, and the prostatic urethra.

The indication for this extensive operation is malignancy _ which has not spread beyond removable limits.

Preparation _ Position _ Anesthesia _ Landmarks _ Incision.—As in Partial Prostatectomy, v. p. 45.

Operation.—All of the steps in this more radical procedure are the same as already described for Partial Prostatectomy (v. p. 45) _ up to the introduction through the membranous urethra of the intravesical tractor, and the downward and outward traction of the prostate gland, and the cleaning of its posterior surface. The final decision is then made as to whether the procedure shall be a partial prostatectomy for hypertrophy or a total prostatec-

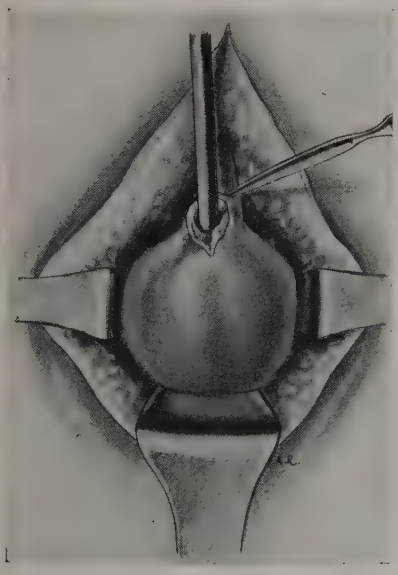

Fig. 5204.—Total Prostatectomy by the Perineal Route _ Young _ I; _ Transverse division of the membranous urethra distal to the incision for the insertion of the tractor into the bladder.

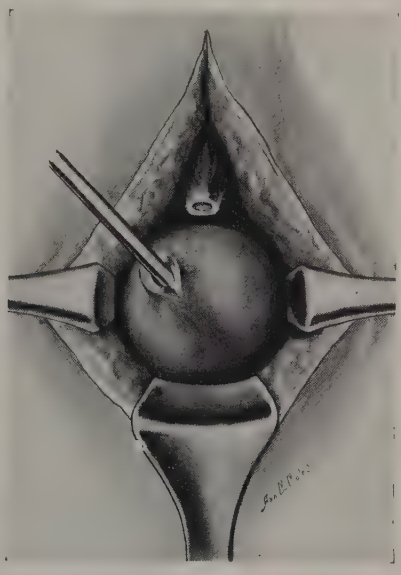

Fig. 5205.—The Same _ II; _ Beginning of the transverse division of the bladder above the prostatovesical junction.

tomy for malignancy. If this decision cannot be reached by digital examination, a section of the prostatic tissue should be made and immediately examined microscopically. If the verdict be cancer, the indication is for the radical operation. With the posterior surface of the prostate thus exposed Dénonvilliers' fascia (v. p. 15) is then traced upward, and the posterior aspect of the seminal vesicles exposed by combined sharp and blunt dissection, chiefly the latter. The lateral surfaces of the prostate are then freed by blunt dissection in the plane between the capsule of the gland and the anterolateral pelvic fascia. If the capsule of the prostate be very closely followed in this step the nerves and the free vascular plexus may be safeguarded.

The membranous urethra is now transversely severed just distal to the tractor (Fig. 5204). This division will enable the handle of the tractor to be considerably depressed, which will, in turn, expose the anterior aspect of the

prostate much more fully – while doing which the surface of the gland is simultaneously freed by blunt dissection carried on close to the capsule, beneath the periprostatic fascia, to escape damaging the vessels of the part, bleeding from which might be troublesome. The puboprostatic ligaments are divided by blunt, curved scissors, which hug the prostate closely, and divide the ligaments as near to the prostate as possible – while pushing the anterior vascular plexus out of the field as well as may be. Vessels which are ruptured and are accessible should be clamped and tied – or, failing in this, gauze should be tightly packed against the posterior aspect of the pubic symphysis and against the triangular ligament, and held there under the pressure of a retractor.

When these steps have been taken laterally and anteriorly – and the seminal vesicles further freed posteriorly – the prostate gland is then brought

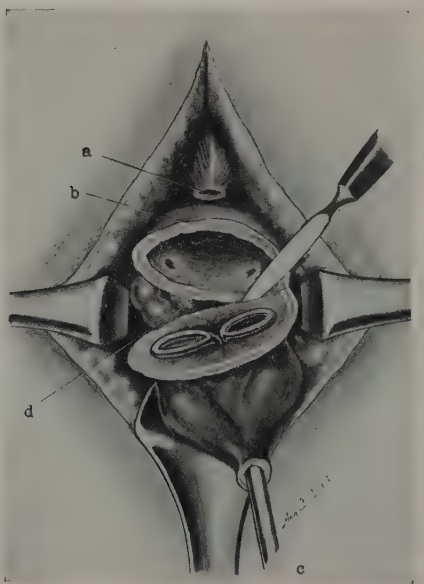

Fig. 5206.—The Same – III; – Completing the excision of neck of bladder: – a, Membranous urethra; – b, bulk of bladder, with ureteral openings left *in situ*; – c, neck of bladder and prostate gland held by opened tractor; – d, right vesicula seminalis and vas deferens. An inward curvature, in making the transverse division of the posterior bladder wall, is desirable.

further downward and outward by traction upon the intravesical tractor – until the anterior wall of the bladder is exposed – which is then transversely incised by knife, at first limitedly, just above the prostatovesical junction (Fig. 5205). This incision, which has opened the bladder, is then continued, with scissors, across the front and around both sides of the neck of the bladder, closely above the line of prostatovesical union. When the trigone of the bladder is reached the incision is completed by knife, by a slightly curved incision, with upward convexity – leaving unharmed the upper aspects of the trigone, and guarding the ureteral openings with especial care (Fig. 5206). The bladder is thus completely divided.

By pressing the bladder upward and drawing the separated prostate downward a transverse interval is opened up between these two structures posteriorly – in which lie the seminal vesicles and ampullæ of the vasa deferentia. The vasa deferentia are freed in this space, picked up with a small

clamp or nerve hook, ligated as high up as possible, and divided (Fig. 5207). Bearing well in mind the important fact that the ureters dip just under the vasa deferentia to reach the bladder – the vasa looping upward over the ureters. The seminal vesicles are then freed along their deeper attachments by blunt dissection from the wall of the bladder. Thus, finally, are removed *en masse* the prostate gland, neck of the bladder, prostatic urethra, seminal vesicles (and ejaculatory ducts, and the ampullæ, including about 5 cm., or 2 inches, of the vasa deferentia). In this final step bleeding is apt to be en-

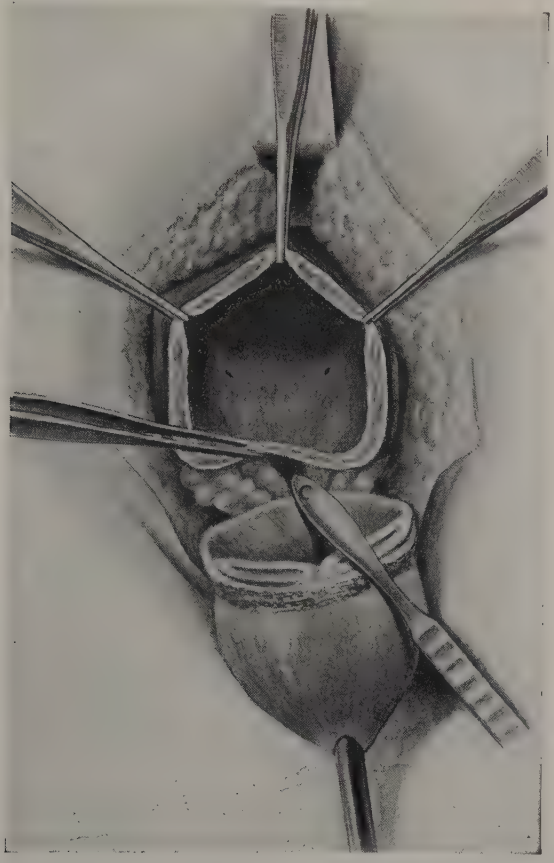

Fig. 5207.—The Same – IV; – The bladder has been transversely severed above the prostatovesical junction – and the trigone of the bladder, prostate gland, and vesiculæ seminales, with more or less of the ampullæ, are being removed *en masse*. The right vas deferens has been tied and the left vas is being tied.

countered in separating the vesiculæ seminales because of the connections between them and the vessels of the prostatic plexus, coursing upward upon each lateral aspect of the prostate. Hemorrhage is here controlled by clamp and ligature, or by pressure with gauze wrung out in hot water. Any visible bleeding vessels in the bladder wall are clamped and tied with fine catgut – the general oozing from these cut walls, however, being controlled when the bladder opening is anastomosed with the urethra in front and closed behind.

The anastomosis of the divided neck of the bladder with the transversely divided membranous urethra is brought about by interrupted chromic cat-

gut sutures _ the free edge of the anterior wall of the divided bladder being brought downward and sutured to the divided membranous urethra _ as much of the margin of the bladder being taken up in the suturing as is required to surround the divided urethra.

A meato-urethro-vesical catheter is placed before the anastomosis is made and anchored at the glans penis. This will leave, posteriorly, a redundancy of free bladder margin _ which is brought together in a median straight line by interrupted, transversely running catgut sutures (Fig. 5208).

The depth of the wound is lightly packed with strips of gauze _ after which the median margins of the divided levator ani muscles are brought together with several catgut sutures. This packing is brought out of the skin wound, which is everywhere sutured, up to the exit of the gauze drains on one side or the other of the inverted V incision.

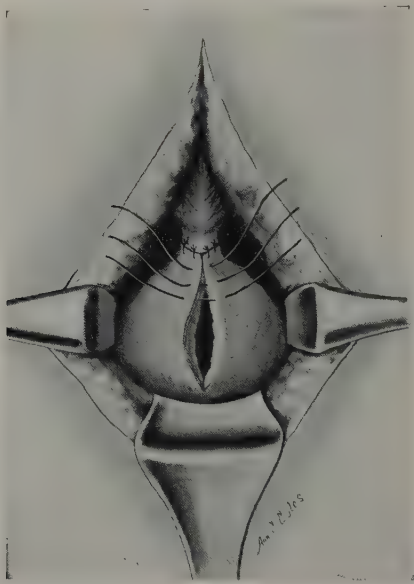

Fig. 5208.—The Same _ VI; _ Suturing (non-penetrating), axially, of walls of main portion of bladder left by circular excision at its neck _ following the suturing of distal portion of the divided membranous urethra to the bladder wall.

In instances where it is impossible to tie the vessels which have been clamped, owing to their inaccessibility, the clamps may be left *in situ*, and be conducted out of the wound along with the gauze drains _ to be unclamped and completely removed in about twenty-four hours.

The after-treatment is very similar to that employed after partial prostatectomy, already described. The bladder receives daily irrigation with boric acid solution _ though the amount thrown in at one time is less than if the entire bladder were present _ not more than 30 c.c. The patient takes freely of water and is put upon urotropin. He sits up, gets up, and is wheeled out as soon as possible.

The gauze packing comes away in two or three days _ and the urethral catheter in a week. The passage of sounds postoperatively is not employed.

Comment.—The rectum should not be packed against tightly with the gauze drains for fear of necrosis. The rectum is largely protected from this pressure by the suturing of the divided levator ani muscles.

In closing the median portion of the bladder, after making the vesico-urethral anastomosis, Young sometimes uses an occasional silkworm suture to provide against the tension of the parts — the ends of the tied sutures being left long enough to come out of the wound along with the drains. When these silkworm sutures are employed no effort is made to remove them by forcible tension under eighteen days.

PARTIAL PROSTATECTOMY BY THE PERINEAL ROUTE

ALBARRAN'S OPERATION

Description.—The special features of this technic, employed for hypertrophy of the prostate, which Albarran stresses, are the following (the descriptions of the partial and total operations largely following his writings): — (*a*) The operation should be as complete as possible, without regard to the conservation of prostatic gland tissue at the cost of not providing free drainage of the bladder. The lateral lobes should be removed, except for the column of tissue left on each side of the prostatic urethra. The median lobe may be developed from the subcervical glands of the neck or may grow from the prostate gland itself — in the first of which cases, especially if the lobe be pedunculated, it may not be possible to remove it from without inward, but from within the bladder (after entering it with the finger) outward — thereby giving freer accessibility, as Albarran claims, than in Young's technic. When the median lobe is sessile (that is, has a broad attachment), it should be removed from without inward (v. i.). The median retrocervical portion of the gland, an essential factor in the success of the operation, is neglected by the majority of Operators. Drainage will not be necessarily secured by the removal of the two lateral and the median lobes (if a median lobe exist). In all cases there is present behind and below the cervical neck a portion of the glandular tissue lying in front of the ejaculatory ducts — and if this part of the prostate be left the bladder will not empty itself as satisfactorily, nor will its neck be as supple as otherwise, and retention of urine will often follow. This median retrocervical portion of the gland would be removed, even though it involve the ejaculatory ducts — stating that one should not allow the question of maintaining genital power, as desirable as it may be, cost the success of the operation. Upon this important subject he writes specially, — "In partial prostatectomies well performed certain patients preserve genital power — the larger number find this power greatly diminished or abolished. When one manages to preserve the ejaculators, the power is much preserved — this is due not to the preservation of the ejaculators, but to the fact that the operation is less complete as to the removal of the prostate gland, and is less destructive of the nerve connections. This result, desirable but not indispensable, is obtained at the cost of the main object of the operation — the retention of urine." (*b*) The preservation of the superior wall of the prostatic urethra should be maintained, so that catheters may be passed. (*c*) Sufficient prostatic tissue should be left as a column on each side of the prostatic urethra both to support the urethral walls and to insure their nourishment (by the transmission of vessels). (*d*) If, through the circumstances of the hypertrophy, an unusually large, baggy prostatic urethra be left, after excision of the lateral lobes, and which may serve as a receptacle for urine, a part of this is axially excised, and the walls united, to lessen its caliber. The scope of the operation is made plainer by Figs. 5209 and 5210.

Preparation — Anesthesia — Landmarks.—As for the operations of perineal prostatectomy, in general.

Position.—The patient is placed upon a special type of perineal rest,

in the form of an adjustable plane, which may be tilted so as to elevate the buttocks to any desired extent, as an aid to bringing the prostate into the field. To this is attached an adjustable perineal retractor, which, as the

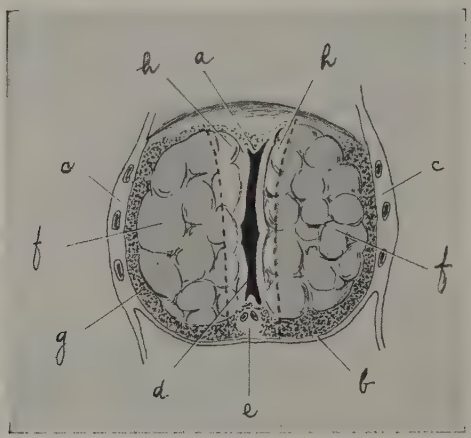

Fig. 5209.—Diagrammatic Transverse Section of the Parts Involved in Albarran's Operation of Partial Prostatectomy: – a, Anterior prostatic commissure; – b, proper capsule of the prostate; – c, periprostatic tissue and vessels; – d, prostatic urethra; – e, ejaculatory ducts; – f, adenomatous portion of prostate; – g, normal prostatic tissue compressed against the capsule by adenomatous enlargement; – h, h, vertical column of prostatic tissue, on each side of urethra, which will be left to support and nourish the urethra; – f, f, intracapsular portions of the lateral lobes of the prostate which will be removed. (Figs. 5209 and 5210 redrawn from Albarran.)

operation progresses, is used for the purpose of securing backward displacement of the postprostatic structures.

Fig. 5210.—Diagrammatic Longitudinal Section of the Parts Involved in Albarran's Partial Prostatectomy: – a, Bladder; – b, prostatic urethra; – c, pre-urethral portion of prostate; – d, retrospermatic portion of prostate, non-adenomatous; – e, prespermatic portion of prostate partly adenomatous and partly normal; – f, portion of the prostate to be removed.

A grooved urethral sound is carried through the urethra – into the bladder, if possible, but anyhow into the prostatic urethra. This is accomplished before the patient is bent into an exaggerated lithotomy position.

Incision.—This is in the form of a slightly concave line, crossing the perineum with forward convexity, from one ischial tuberosity to the other, reaching, anteriorly, to the retrobulbar depression, in the middle line (the depression lying, usually, about 3 cm., or $1\frac{3}{16}$ inches, in front of the anus—Fig. 5211, a).

Operation.—The curved, transverse incision is deepened through the skin into the cellular tissue—after which the latter, which may be quite thick, is opened up, largely by blunt dissection, until the flap of the skin and fascia is sufficiently freed to be displaced backward (Fig. 5212)—exposing the spaces on each side of the central tendon, and the white median bulbo-anal raphé, which overlies the median junction of the two bulbocavernous muscles (which extend forward and outward on each side). After dividing the external sphincter and superficial transverse perineal muscles the recto-urethral muscle is divided close to the bulb—which brings the posterior surface of the bulb into the field, and, by following this closely, in the median line and backward, the membranous urethra is encountered, and is further recognized by feeling the grooved sound within it. Thus the retroprostatic space is

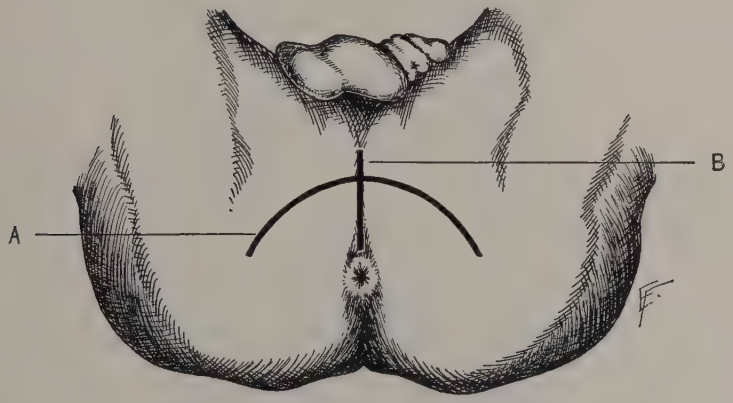

Fig. 5211.—Perineal Routes for Exposing Prostate Gland:—A, Transverse curved incision; B, median perineal incision.

opened up. The key to this stage of the operation is the carrying on of the dissection close to the bulb of the urethra.

The separation of the prostate from the rectum, after recognizing the membranous urethra, is accomplished by blunt dissection—with the right index-finger, working with it as a blunt dissector, with the nail toward the bulb and the pulp of the finger toward the membranous urethra, the prostate and the rectum. If any resistant bands are encountered, remaining uncut after the division of the recto-urethralis, these are broken down or carefully divided—with especial care against penetrating the rectum—which, if necessary, may be guarded by a finger within it. The freeing is thus continued in the retroprostatic space until two fingers can be introduced and further complete the blunt dissection by traction in opposite directions (Fig. 5213).

At this stage the special posterior retractor attached to the inclined support upon which the patient rests is adjusted—its blade being slipped in behind the rectum and made to depress the rectum, which it also guards. Being adjustable, it may be carried in as far and be as deeply depressed as required. At the same time the angle of the plane upon which the patient rests is increased, so as to elevate the buttocks sufficiently to give a good view

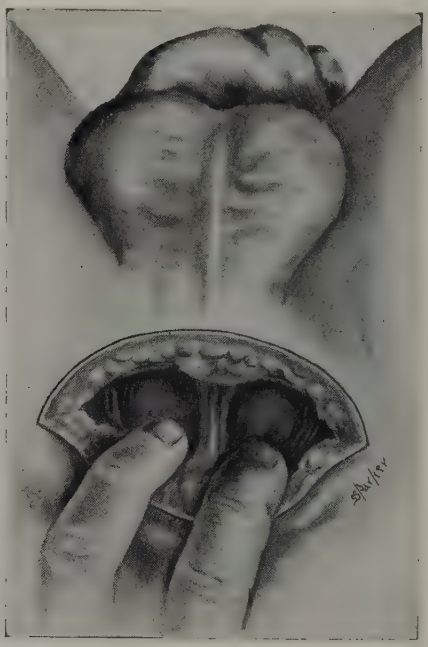

Fig. 5212.—PARTIAL PROSTATECTOMY BY THE PERINEAL ROUTE – Albarran – I; – Digital depression of the perineal flap exposing the bulbo-anal raphé (sphincter ani muscle and bulb). (Figs. 5212–5218 modified from Albarran.)

Fig. 5213.—The Same – II; – The two index-fingers are freeing the prostate from the rectum – having incised the forward extension of the sphincter ani and recto-urethral muscles, thus exposing the bulb and the membranous urethra.

of the now exposed posterior surface of the prostate covered by its glistening capsule _ and, in front of it, the urethra, embraced by it.

The prostatic capsule is now freed from the presenting surface of the gland. This is accomplished by carrying a median incision through the capsule only (or, at most, only into the superficial tissue of the gland), from the level of the urethra to the base of the gland. The margin of the capsule, first on the right and then on the left, is seized with forceps, and dissected from the surface of the gland with a blunt dissector, and with the tip of the finger or with curved Mayo scissors, carrying on the decortication of the gland as far laterally and anteroposteriorly as possible. To aid in this decortication, after the capsule has been freed to some extent, two lateral cuts may be made with scissors into the capsule, in opposite directions, at the upper

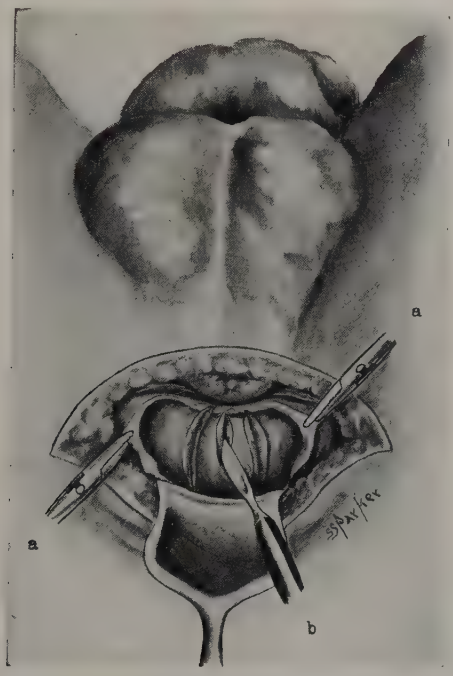

Fig. 5214.—The Same _ III: _ a, a, Retraction of detached prostatic sheath; _ d, median incision of prostatic urethra made after the decortication and really preceding the lateral incisions. The prostatic tissue is deeply incised 5 mm. (3/16 inch) to each side of the urethral incision as the beginning of the enucleation of the lateral lobes.

and lower endings of the median incision through the capsule. The divided and retracted prostatic capsule and underlying prostate gland are seen in Fig. 5214.

The prostatic urethra is next incised _ which is accomplished by rendering prominent the grooved sound which had been previously placed in the urethra, and making a median incision over this, through the prostatic tissue, into the groove of the staff _ the incision, beginning over the anterior portion of the prostate, being about 2.5 cm. (1 inch) in length, upon the surface, but not opening the prostatic urethra for a greater distance than required to admit the finger. The sound, exposed in the bottom of the wound, is withdrawn through the meatus, and the Surgeon inserts his finger into the prostatic urethra _ examines the condition of the prostate _ and is then introduced

into the neck of the bladder, which it also examines for any condition which might modify the course of the operation.

The excision of the lateral lobes is next carried out. An incision parallel with the median urethral incision and about 5 mm. (3/16 inch) to the right of it is made _ the object being to pass as nearly through the full thickness and length of the lateral lobe as the knife can be safely made to pass without the danger of passing all the way through and wounding contiguous structures, especially the bladder. For this reason the incision should at first be only about 2 cm. or 2.5 cm. (13/16 or 1 inch) in depth, and not passing quite to the extreme anterior and posterior limits of the lobe, unless these can be well defined. Information gotten at the previous intra-urethral examination will largely guide at this stage. The right lobe (one blade in the lateral wound,

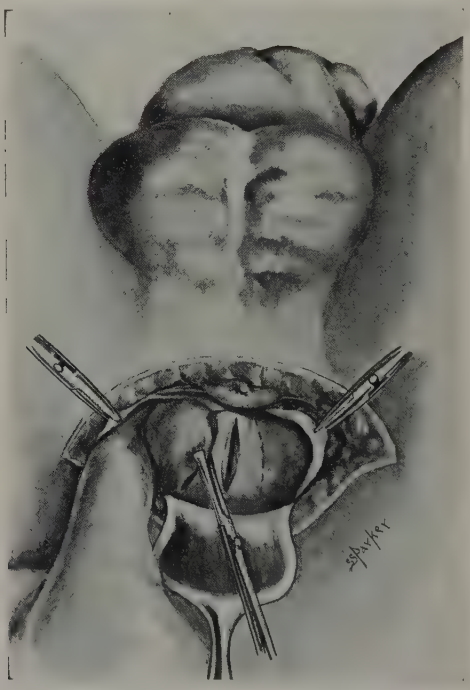

Fig. 5215.—The Same _ IV; _ Enucleation of the right lateral lobe which forceps are drawing toward the median line _ while the index-finger is bluntly dissecting between the lobe and its sheath.

and the other outside of the lobe) is now seized with clamp forceps and drawn outward and over toward the median line _ while the Surgeon's left index-finger is carried between the lobe and its already partly separated sheath. Thus, by forceps traction and finger dissection around all of its aspects, the lobe is largely freed (Fig. 5215) _ after which the rest of its connections may be divided with curved Mayo scissors, with which the section through the lobe, begun by knife, is finished. All cutting and separation is done rather away from, than toward, the median prostatic bridge, which surrounds the urethra. The lobe is removed as nearly entire as possible, but will sometimes have to be taken away in pieces. Into the space left by the excised lobe the finger is carried for examination _ and if any portion of the lobe be found left behind, for which careful search is made, it is withdrawn by the finger or

dissected out. The same steps which have just been applied in excising the right prostatic lobe are carried out in removing the left lobe. If the two first fingers are now introduced into the two cavities left by the lateral lobes, it will be seen that they come into contact with the median column of prostatic tissue containing the urethra.

Removal of the median lobe of the prostate comes next in order. One of three possible conditions of the middle lobe may be encountered _ it may be pedunculated (attached by narrowed base) _ sessile (attached by broad base) _ or altogether absent.

If the median lobe be pedunculated it is sometimes possible to displace it somewhat to one side and bring it through the already incised prostatic urethra either by the finger or by forceps guided by the finger, when it may

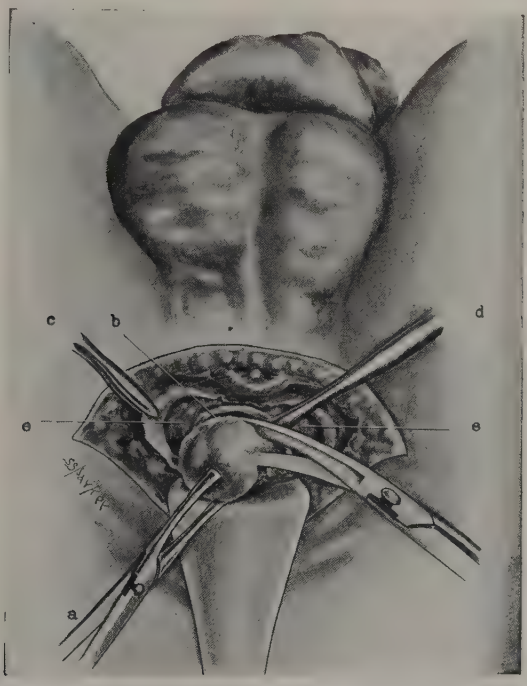

Fig. 5216.—The Same _ V: _ a, Removal of the middle lobe through the incised urethra, b; _ c, forceps grasping the capsule of the prostate; _ d, blunt dissector working between the urethra and middle lobe; _ e, e, space between the urethra and capsule of the prostate, beds of the enucleated lateral lobes.

be freed by blunt dissection with the finger or be divided by curved, blunt scissors (Fig. 5216). Sometimes this lobe can be more readily enucleated by incising the thin mucosa which covers it. If the pedicle seems to contain prostatic tissue, it may be excised with scissors, and the margins of the resulting wound sutured as well as possible.

If the median lobe be attached by a broad base (sessile), the left finger is introduced into the bladder and depresses the lobe into the perineal wound _ where a pair of scissors severs it, from before backward, cutting it off horizontally below the level of the urethra _ thus removing the median retrourethral portion of the prostate on a level with the base of the gland and in near proximity to the seminal vesicles (Fig. 5217). The median retrocervical portion of the prostate which has been detached from the urethra and the

bladder retracts, and is only supported by the vesiculæ seminales and the ejaculatory ducts. In proportion as the median retro-urethral prostatic bar is detached from the cervical neck, the finger feels the projection of the median lobe disappear, and the bladder to lower itself.

Excision of the median retro-urethral portion of the prostate is often necessary in order to secure satisfactory emptying of the bladder and to constitute a satisfactory result of the operation – which requires that the neck of the bladder and the deep urethra be perfectly supple and represent an inclined plane tilting downward and forward. In order to accomplish this it is not only necessary that the lateral lobes be removed, but it is also necessary to remove the posterior median part of the prostate (the part which constitutes, developmentally, the prespermatic portion), especially as this is

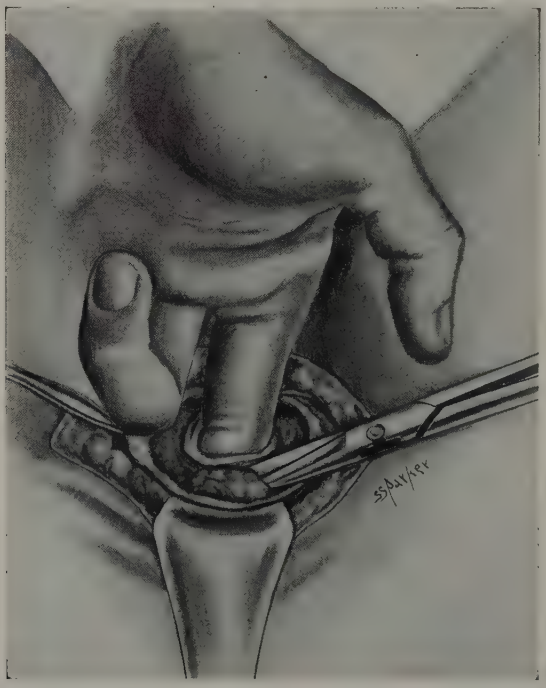

Fig. 5217.—The Same – VI; – Excision of the retrospermatic portion of the prostate, aided by finger introduced into the bladder, followed by the downward and forward depression of this part.

inclined to grow thicker as one approaches the neck of the bladder – and in this operative procedure the ejaculatory ducts are sacrificed. Albarran states that the majority of Surgeons fail to remove this prespermatic portion of the prostate, and that to this negligence must one only too often attribute the incompleteness of the perineal operation.

When a very large prostate is removed it sometimes happens that a large, baggy undernourished prostatic urethra may be left – which may necrose from insufficient blood-supply, or which may serve as a receptacle for urine. In such cases a certain portion of the wall of the prostatic urethra is excised with scissors while held by forceps axially from each side of the original incision in the floor of the prostatic urethra – and the resulting margins are brought together by suture.

Finally, in concluding the operation, if the urine be aseptic, or but slightly infected, the urethral incision is entirely sutured – and a catheter left in the bladder as a vesico-urethromeatal drain. In cases of infection, on the other hand, perineal drainage of the bladder is established.

In closing the urethra – a No. 21 F. rubber catheter is carried into the bladder from the urethra – after which the incised prostatic urethra is closed by No. 1 catgut sutures, which pass through all the walls of each lip except the mucosa.

In perineal drainage – rubber tubing, of from No. 25 to 30 F., is employed – beveled and with a large opening at the bladder end. This is introduced

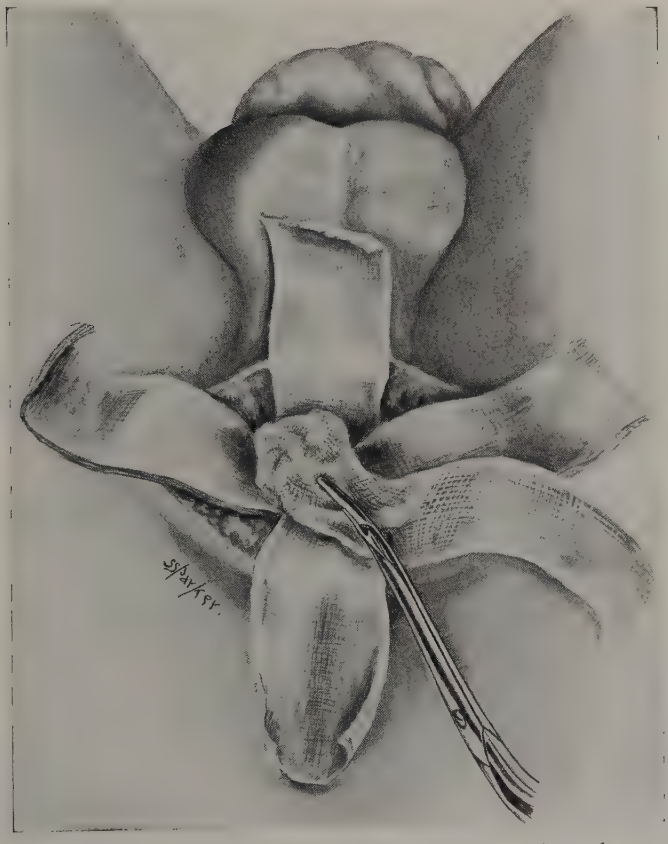

Fig. 5218.—The Same – VII; – Tamponading deep perineal wound.

into the bladder, and is conducted out through the anterior portion of the incised prostatic urethra – the posterior portion of the incision being sutured, so as to lessen the urethral wound. It is then conducted out of the perineal wound to the anterior skin margins, to which it is anchored. Before, however, the perineal wound is closed up to the exit of the gauze (and of the bladder drain, if one be brought out by the perineum), the integrity of the bladder and the efficiency of the suturing are tested by injecting saline solution into it. Not a drop of leakage should follow.

To guard against possible bleeding a special gauze packing of the recess

formerly occupied by the lateral lobes of the prostate, and the perineal wound, is employed.

Two strips of double, hemmed gauze are carried to the bottom of the cavities at right angles to each other _ and upon these other strips of gauze are packed with reasonable firmness (Fig. 5218). Such packing, rather than haphazard crowding in of gauze, is more easily and comfortably removed when the time comes.

In concluding the operation the posterior mechanical retrator, which has remained in action throughout, is removed while holding the gauze packing in position by the opposite hand. The ends of the transversely curved wound are closed by suture up to the exit of the drains. The perineal wound is dressed with gauze compresses held by a T-bandage or substitute.

As an associated part of the operation Albarran, immediately upon the conclusion of the main technic, and under the same anesthesia, exposes both vasa deferentia, in the upper part of the scrotum above the epididymes, on each side, and divides them between catgut ligatures _ for the purpose of avoiding the frequently occurring complication of orchitis.

Following operation cases with aseptic bladder receive a daily irrigation of weak protargol solution _ and those with infected bladders, one or two irrigations daily with a solution of nitrate of silver, 1 : 1000.

The inner strips of gauze packing may be replaced when indicated _ but the deeper strips are not usually removed for forty-eight hours _ after which the perineal wound is irrigated once or twice daily with a solution containing hydrogen peroxid.

The bowels are moved on the third day.

The bladder catheter remains *in situ* until the progress of the perineal wound indicates that the urethra is soundly closed. It is usually removed on the twentieth or twenty-third day.

TOTAL EXTRACAPSULAR PROSTATECTOMY BY THE PERINEAL ROUTE _ ALONG WITH THE EXCISION OF THE BLADDER NECK, FOLLOWED BY UNION OF THE BLADDER WITH THE URETHRA

ALBARRAN'S OPERATION

Description.—This radical measure is undertaken in malignancy of the prostate _ and its scope is very much the same as that described in Young's corresponding operation (v. p. 56).

Preparation _ Anesthesia _ Landmarks _ Position _ Incision.—As for Albarran's partial prostatectomy by the perineal route, p. 61.

Operation.—The patient is sometimes placed in even a more extreme lithotomy position than in the operation just described _ and, if necessary, the incision there described may be added to. The steps of the procedure are the same as in the partial operation _ up to the exposure of the posterior surface of the prostate, and the insertion of the automatic perineal retractor attached to the inclined perineal rest. The prostate is, thenceforward, freed extracapsularly _ instead of, as in the last operation, intracapsularly. When this has been largely accomplished the posterior aspect of the prostate, including the urethra, from the junction of the membranoprostatic portion to the bladder, is incised in the median line upon the previously introduced grooved sound. This is both to give access to the parts and also to secure prostatic tissue for holding by clamps, in the forward traction of the parts in the rest of the procedure. This posterior splitting of the prostate is seen, in Fig. 5219. The urethral sound is then withdrawn, and the membranous urethra is transversely divided just in front of the prostate.

Each half of the divided prostate is now seized, in turn, with forceps and freed in the rest of its extent largely by blunt dissection and partly by curved, blunt-pointed scissors, while under traction by the clamp forceps _ hugging the outer surface of the prostatic capsule, and harming the vascular plexuses in the periprostatic tissues as little as possible. The two halves of the prostate, still united in front, are freed, upon their anterior aspect, up to the bladder, and everted.

The beginning of the transverse division of the neck of the bladder is now begun while the prostatic tissue is held under tension _ the incision passing at first only across its anterior aspect of the neck, on a level just above the prostatovesical junction, and well below the ureteral orifices.

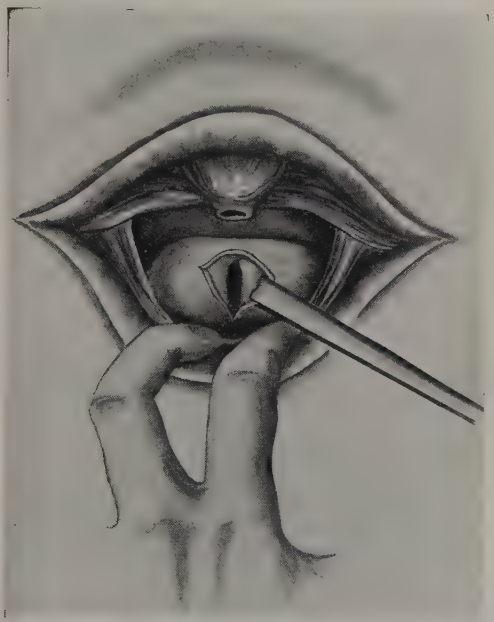

Fig. 5219.—TOTAL EXTRACAPSULAR PROSTATECTOMY BY TRANSVERSE PERINEAL INCISION _ Albarran _ I; _ The prostate and floor of the prostatic portion of the urethra is split to secure a better grip for forceps in the subsequent manipulations from its membranous portion to the neck of the bladder. The membranous portion of the urethra is then transversely divided in front of the prostate. (Figs. 5219–5221 modified from Albarran.)

The anterior aspect of the prostate is now split in the median line as was the posterior aspect _ thus opening up access to the anterior surfaces of the seminal vesicles, and enabling the posterior half of the neck of the bladder, including the trigone, to be transversely divided in continuation with the already made transverse division of the anterior half of the neck.

When this posterior, retrovesical space is opened up first the left and then the right half of the prostate is dealt with in turn (Fig. 5220). The seminal vesicle and vas deferens, corresponding with the half of the prostate being removed, are freed in their retrovesical connective-tissue beds _ the vas tied and divided _ and the parts removed.

Instead of making the transverse division of the trigone of the bladder at one sweep, one-half of the trigone may be divided at a time, in conjunction with and corresponding with the half of the prostate being removed _ especially in the case of very large prostates and in difficult cases. Where the

prostate is not very large nor the operation very difficult, it may not be necessary to even carry out the anterior splitting of the prostate – but simply

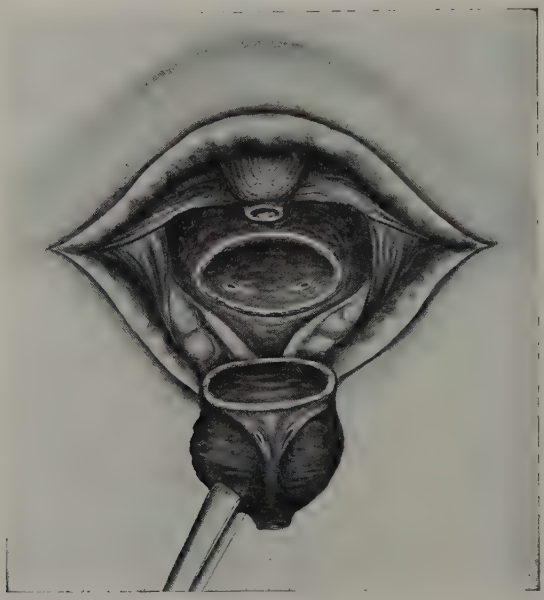

Fig. 5220.—The Same – II; – The bladder is divided between its neck and the ureteral orifices. The detached portion, with adherent prostate, split posteriorly and anteriorly, is turned downward and backward in the act of removal – exposing the seminal vesicles.

draw the posteriorly split portions of the prostate downward and backward, and divide the trigone transversely at one cut.

Fig. 5221.—The Same – III; – Suturing up the excess of the bladder – and the suturing of the reduced bladder opening to the divided urethra.

Finally, the divided neck of the bladder is drawn down and held by a clamp while being sutured to the divided membranous urethra, in the same

general way as described in Young's operation (v. p. 56) _ and as pictured in Fig. 5221. The excess of the bladder opening is then closed by a median line of sutures. In making the vesico-urethral anastomosis the floor of the membranous urethra is sometimes divided, longitudinally, for a few millimeters _ to secure a larger urethral circumference for union with the neck of the bladder.

At the end of the operation a catheter is carried from the meatus into the bladder and anchored, for temporary drainage.

PARTIAL EXTRACAPSULAR PROSTATECTOMY BY THE PERINEAL ROUTE

PROUST'S OPERATION

Description.—The features of the operation are: _ that the retroprostatic space is fully exposed by deeply placed special anterior and posterior

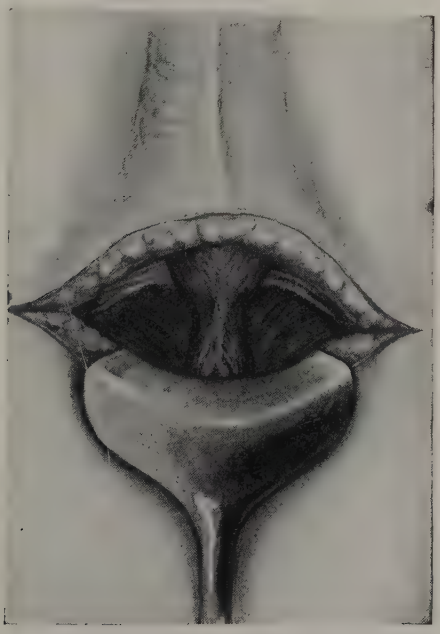

Fig. 5222.—Partial Extracapsular Perineal Prostatectomy _ Proust _ I; _ Incision of the perineum, exposing, after superficial dissection, the bulbous part of the urethra, with the accelerator urinæ (bulbocavernosus m.), sphincter ani, transverse perineal, and levator ani muscles.

retractors _ that the prostate is brought into the perineal wound by a special tractor introduced into the bladder through the incised prostatic (rather than the membranous urethra) with closed blades, which are afterward separated _ that the enucleation is carried on externally between the capsule and the sheath, and internally between the urethra and the prostatic tissue _ that enough prostatic tissue is left around the urethra to support it and supply it with blood _ that the vasa deferentia are ligated to prevent epididymitis and orchitis _ and that, in concluding the operaton, after elliptically excising the excessive girth of the distorted prostatic urethra, both perineovesical and meato-urethrovesical drainage are established.

The recognition of the need for ligating the vas deferentia is not acknowledged by all.

Preparation.—The perineum is shaved and surgically prepared. The bladder is irrigated. A staff is carried into the bladder before the patient is placed in position.

Position.—The patient is placed in a special posture, known as the sacro-vertical _ which is a markedly exaggerated lithotomy position _ supports for accomplishing which may be attached to the end of the table. In this position the plane of the perineum is horizontal. The Assistant so holds the previously introduced staff that the urethra is pushed toward the pubis away from the danger of being cut in the early part of the operation.

Incision.—A transversely curved incision is carred across the perineum _ its forward convexity reaching a point just posterior to the bulb in the median line _ and its ends approaching the ischial tuberosities.

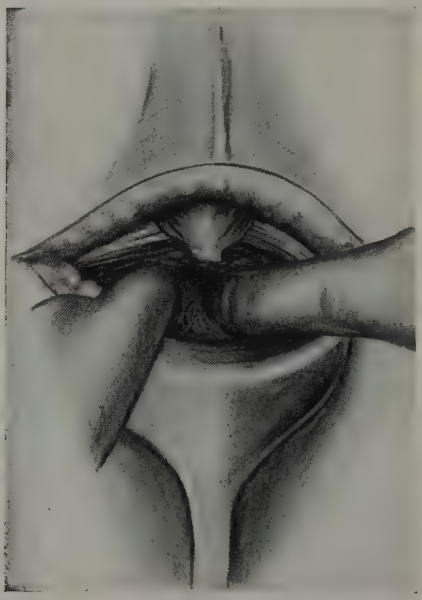

Fig. 5223.—The Same _ II; _ Having incised the sphincter ani recto-urethral muscles, and opened up the connective-tissue plane between the rectum and prostate, the two index-fingers are introduced to increase the working space and clear the surface of the prostate.

Operation.—This incision is deepened through skin and fascia _ until the external sphincter ani is exposed, posteriorly, and the urethral bulb, covered by the bulbocavernosus, anteriorly _ the two being united in the median line by the fibromuscular anobulbar raphé (Fig. 5222). The anobulbar raphé is cut transversely _ the urethral bulb retracted forward _ the transverse perineal muscles and posterior margin of the wound retracted backward _ the levatores ani muscles displaced laterally from the middle line _ and the recto-urethralis muscles divided transversely near the membranous urethra. In the space thus exposed blunt dissection with the fingers will open up the retroprostatic space between the prostate in front and the rectum behind (Fig. 5223). This is the rallying step of the operation _ affording direct exposure of the posterior surface of the prostate.

A Proust broad-bladed posterior retractor (Fig. 5224, although not shown in the wound) is introduced posteriorly, and draws the rectum well backward _ and Proust's bifid retractor (v. Fig. 5225) straddling the membranous

urethra, draws the anterior structures forward – the disposition of the parts shown in Fig. 5225 being thus brought about. The prostatic urethra is then incised in the median line upon the intra-urethral staff. Thread-tractors are

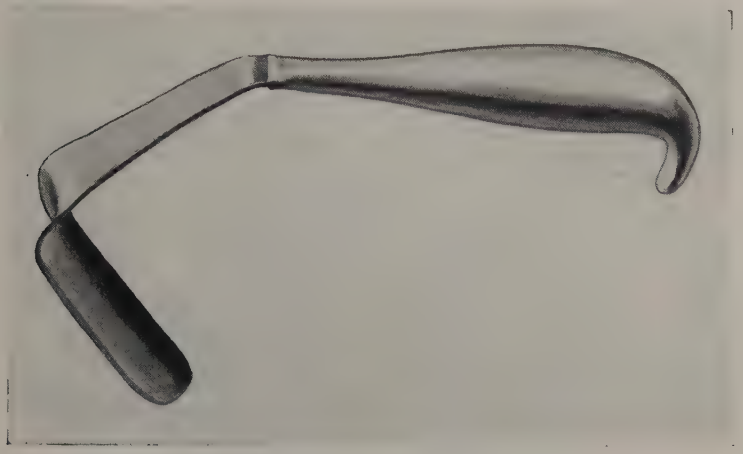

Fig. 5224.—Proust's Prostatectomy Rectococcygeal Retractor.

placed in the incised urethral lips (the staff being withdrawn) by which they are controlled during the introduction, through the urethral incision into the

Fig. 5225.—The Same – III; – Proust's horseshoe retractor is seen exposing the membranous urethra – while the prostatic urethra is being incised medially.

bladder, of the special closed tractor, the blades of which are then separated, and traction upon these draw the prostate downward.

The separation of the outer aspect of the prostate is accomplished by seiz-

ing the lip of the incised sheath on each side with a clamp, and then bluntly dissecting the sheath from the outer surface of the gland with the index-finger (Fig. 5226). The separation of the inner aspect of the prostate – that is, the portion next to the urethra – is accomplished by first carrying the incision of the floor of the prostatic urethra backward to, but not through the neck of the bladder – after which one index-finger is carried into the urethra for guidance during the manipulation, while with the opposite index, together with a curved blunt dissector and curved Mayo scissors, the inner aspect of the gland is freed from the urethra, first one lobe, and then the other, while being depressed from within the bladder by the tractor and drawn down by forceps. Sufficient prostatic tissue is left in contact with the urethra to give it support and blood-supply. Intravesical extensions of the prostate are depressed into the general wound by means of a finger within the bladder, and are then enucleated or cut off – carefully avoiding wounding the bladder.

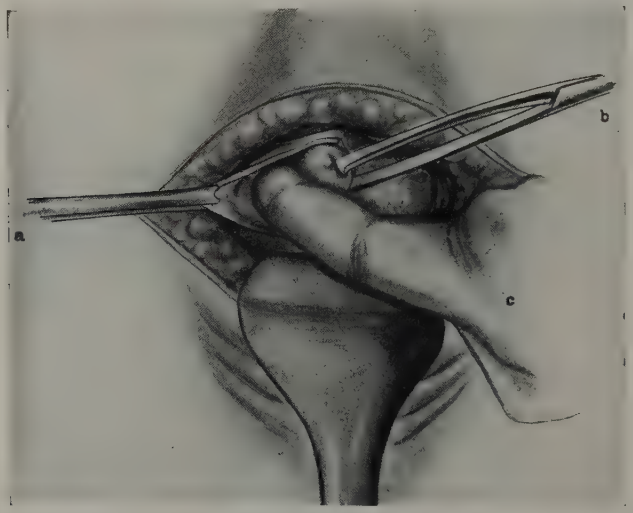

Fig. 5226.—The Same – IV: – a, Tractor drawing outward the divided connective-tissue sheath of the prostate (anterior layer of Dénonvillier's aponeurosis); – b, forceps grasping the right lateral lobe along its incised inner aspect, drawing it inward; – c, finger enucleating outer aspect of right lateral lobe, following cleavage line between gland and sheath.

The ejaculatory ducts are exposed and ligated to prevent epididymitis.

In many of these cases the prostatic urethra is distorted and greatly enlarged, furnishing possible pockets for collections of urine. In such cases the excess of urethral wall may be elliptically excised – after which the margins of the proximal end are closed by suture, while the terminal portion is left open for the perineal exit of a catheter from the bladder (Fig. 5227). In addition, another catheter is carried into the bladder from the meatus, thus providing for inlet and outlet irrigation of the bladder. Both catheters are anchored to the skin.

In closing the wound the median borders of the levator ani muscles are sutured with catgut – and whatever other repair of the deep perineal structures which may be made by buried suturing, without interfering with drainage, is carried out. The deep perineal wound is drained with strips of gauze – which emerge from the center of the superficial perineal wound, which is then closed up to their exit. A large overlying dressing is applied and a firm perineal

binder, for the purpose of aiding in the normal approximation of the deeper parts.

Subsequently, the bladder is irrigated twice daily through the urethral cathether – urinary drainage taking place through the perineal catheter,

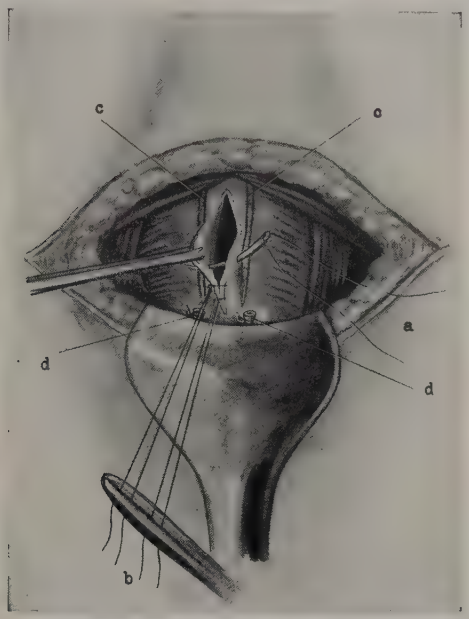

Fig. 5227.—The Same – V: – a, Suturing the proximal end of the prostatic urethra; – b, each tied suture serving as a tractor, thereby helping to secure accessibility of the urethral lips during the suturing; – c, c, sheath of prostate; – d, d, ligated ejaculatory ducts. The distal end of the incised urethra will be left open for catheter drainage.

which leads to a urinal. The latter catheter is usually removed in a week – and the former in about three weeks, being changed at intervals in the meantime.

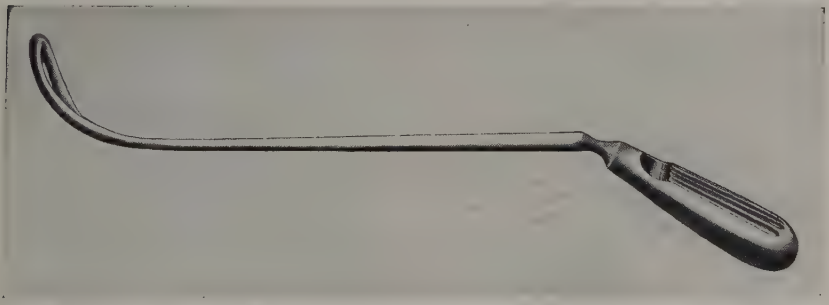

Fig. 5228.—Ferguson's Prostatic Depressor.

Comment.—If the prostatic lobes cannot be removed *en masse*, Albarran makes the suggestion (which Proust endorses) that they should be removed by morcellation.

A serviceable type of depressor and enucleator in these cases is seen in Fig. 5228.

PARTIAL EXTRACAPSULAR PROSTATECTOMY BY THE PERINEAL ROUTE

PARKER SYMS' OPERATION

Description.—The salient feature of this technic is the introduction into the bladder through a simple median external perineal urethrotomy wound of a special dilatable rubber bag, which, when distended with water and drawn upon by its tube, serves as a tractor, by which the prostate gland is drawn down into the wound and held within reach during enucleation.

The special rubber-bag tractor and introducer are shown in Fig. 5229.

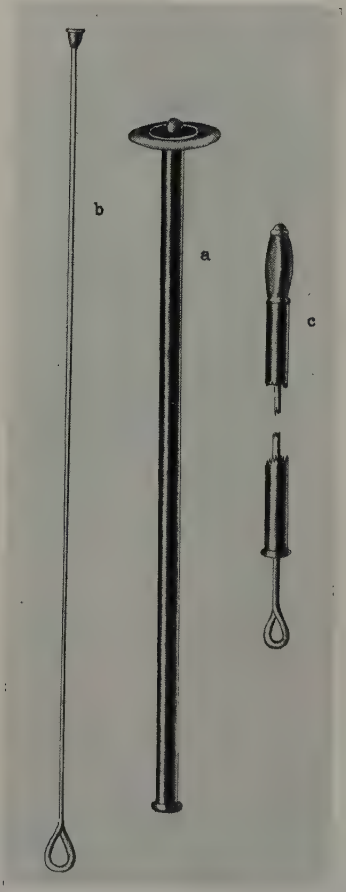

Fig. 5229.—PARKER SYMS' SOFT-RUBBER RETRACTOR, a; with metal stylet, b; with the same shown ready for introduction, c.

Preparation _ Anesthesia _ Landmarks.—As for Perineal Prostatectomy, in General.

Position.—The patient lies in the extreme lithotomy posture (Fig. 5230). A medially grooved staff, however, is carried through the urethra into the bladder before this position is assumed.

Incision.—As for median external perineal urethrotomy (v. Vol. V, p. 668) _ the incision extending from the retrobulbar furrow to the apex of the prostate.

Operation.—The initial step of the operation is that of a simple external

Fig. 5230.—EXTRACAPSULAR PROSTATECTOMY BY THE PERINEAL ROUTE – Parker Syms – I; – Median external perineal urethrotomy.

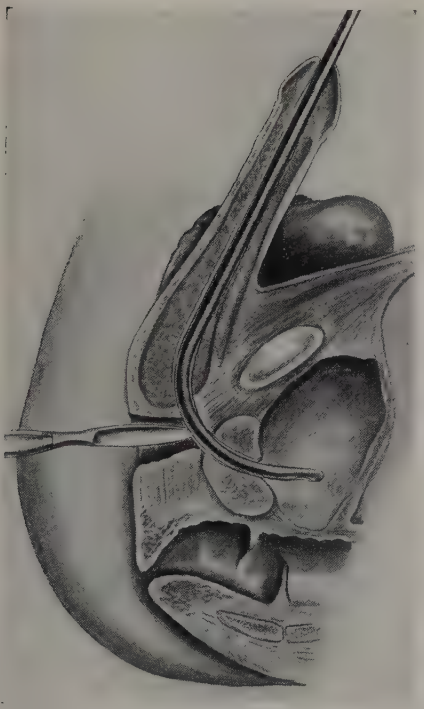

Fig. 5231.—The Same – II; – Incising the membranous urethra for the insertion of the rubber-bag tractor.

Fig. 5232.—The Same – III; – Forward and upward traction upon the prostate exercised by pulling upon the filled rubber bag introduced into the bladder.

perineal urethrotomy – a median perineal incision is boldly made, from the skin, into the median groove of the staff – entering the groove of the staff just behind the urethral bulb, and incising the entire membranous urethra, to the apex of the prostate (Fig. 5231).

The index finger is carried into the bladder through the urethal incision, dilating the prostatic urethra as it goes – as the staff is withdrawn – and an intravesical examination of the cervical and prostatic regions made. The bladder is irrigated.

The sheath of the prostate (the posterior layer of the deep fascia) is exposed by blunt dissection – all the prerectal tissues being displaced backward. The collapsed rubber-bag tractor is carried through the incised urethra into the bladder by means of its introducer – after which it is filled with water by a piston syringe and the rubber tube clamped. Traction is then made

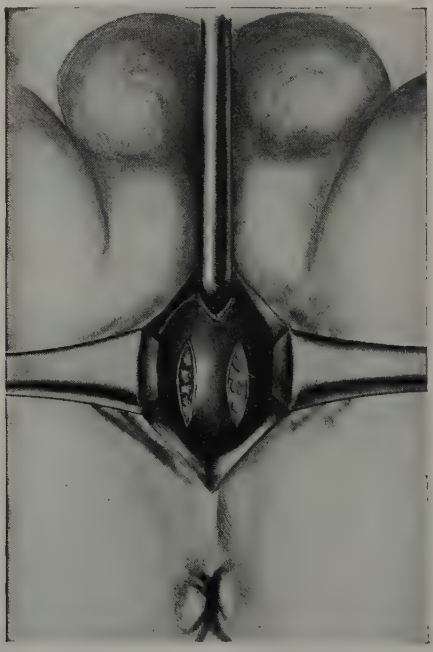

Fig. 5233.—The Same – IV; – Two parallel lateral incisions through the sheath of the prostate – preparatory to the beginning of enucleation.

and the prostate, covered by its sheath, brought further down into the wound (Fig. 5232).

Two parallel axial incisions are made, one over each lateral lobe, through the sheath of the prostate (Fig. 5233) – and, as soon as the line of cleavage is well defined, first one lobe is enucleated and then the other.

The finger is then introduced into the bladder, and any further pedunculated prostatic lobes that are discovered are delivered from within the neck of the bladder down into the wound by digital depression, and removed.

Examination is made for calculi.

In completing the operation the anterior urethra is irrigated – a double drainage-tube is carried into the bladder – the prostatic cavity and the perineal wound are packed with iodoform gauze – and temporary sutures are inserted, one of which anchors the drainage-tube – and a perineal dressing applied.

Continuous irrigation is maintained through the double-way tubes for forty-eight hours to remove all clots which may form. The temporary sutures and the gauze packs are removed within twenty-four hours _ and the drainage-tube usually at the end of forty-eight hours _ after which the patient is allowed to leave the bed.

A full size sound is passed within a few days after operation _ but repeated passage of sounds is not needed.

PERINEAL PARTIAL PROSTATECTOMY BY MEDIAN EXTERNAL URETHROTOMY AND FINGER ENUCLEATION

WATSON'S TECHNIC

Description.—The especial features of this procedure are: _ that the exposure is made through a median perineal incision rather than through

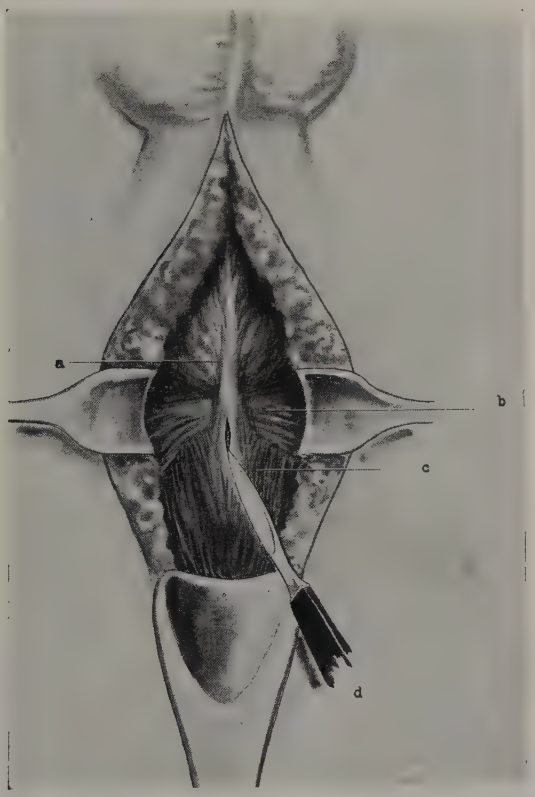

Fig. 5234.—Perineal Prostatectomy Through Median External Urethrotomy, Followed by Finger Enucleation _ I: _ a, Bulb of urethra covered by accelerator urinæ muscles; _ b, transversus perinei muscle; _ c, levator ani muscle; _ d, incising the urethra upon a grooved staff.

any form of transverse incision, as usually adopted _ and that the enucleation is accomplished digitally _ and without any form of tractor introduced into the bladder. The following description is largely from Watson:

Preparation.—Perineum shaved and disinfected _ rectum emptied _ bladder irrigated _ urotropin by mouth three days in advance _ saline hypodermoclysis immediately before operation.

Position.—Lithotomy posture, with hips only slightly (not exaggeratedly) elevated.

Anesthesia is generally preferable to spinal analgesia, or to rectal anesthesia.

Landmarks.—Median perineal line _ retrobulbar furrow and bulb _ anus.

Incision.—Median perineal, from over the bulb to within a short distance of the anus _ calculated to expose the bulb and the forepart of the membranous urethra.

Operation.—A medially grooved staff is passed down the urethra into the bladder _ or, if blocked, at least through the membranous urethra. Having exposed the urethral bulb and membranous urethra (Fig. 5234) _ the posterior

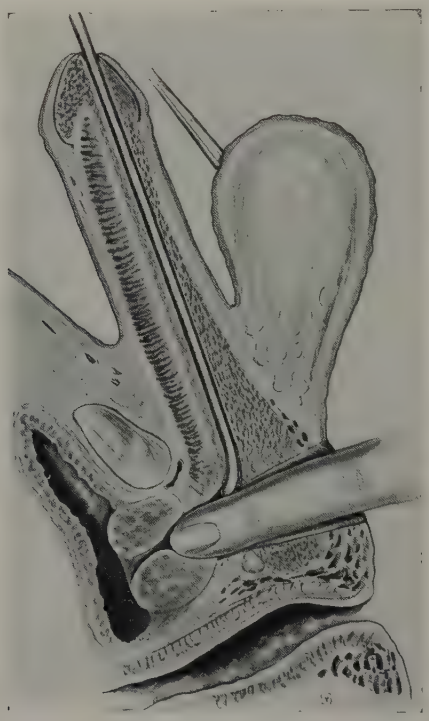

Fig. 5235.—The Same _ II; _ The finger is introduced through the incised perineum and membrano prostatic urthrea _ and thence on into the bladder.

portion of the membranous and anterior portion of the prostatic urethra is medially incised upon the groove of the staff, guided to it by the nail of the left index-finger _ and making the incision sufficiently long to admit the finger. Upon the withdrawal of the staff the prostatic urethra is dilated, in order, by three steel sounds of increasing size, by the little finger, and then by the index-finger (Fig. 5235).

An Assistant presses the prostate firmly down into the wound by fingers pressing the suprapubic abdominal wall down behind the pubis _ as an initial step to the beginning of the enucleation (Fig. 5236) _ where it is also seen that, at a later stage, a finger in the rectum may aid in bringing the prostate into better manipulative reach of the enucleating finger. Watson claims that, except in patients with thick abdominal walls, this procedure will bring the

prostate as readily within reach as will any form of special prostatic tractor _ gives more working room for the finger _ and is less apt to damage the bladder wall.

The right index is now carried into the prostatic urethra, with nail downward and, with the nail, a lateral, axial opening is made in one of the two side walls of the urethra, through the mucosa and intervening tissues, down to the proper (true) capsule of one of the lateral lobes of the prostate _ the finger-nail scratching its way through. (A regular gum lancet, cutting only at its end, which is at a right angle to its handle, or a similar type of instrument, may be conducted along the finger, and with this the incision from urethral mucosa to true capsule may be made.) Or the finger may work its way under the floor of a lateral lobe, and pry it thence upward. Having insinutated the finger-tip through the mucosa, down to the proper (fibrous) capsule of the gland, the

Fig. 5236.—The Same _ III; _ In the process of enucleation depression of the bladder behind the symphysis aids in pushing downward and steadying the gland. Aid may also be secured through steadying and elevating the prostate by a finger within the rectum.

finger is carried under the posterior aspect of the lateral lobe, between the proper capsule and the sheath (connective-tissue covering), severing the fibrous attachments _ and then, in turn, over the outer and superior aspects, to the anterior commissure in the median line. Next the apex of the lateral lobe is detached from the triangular ligament _ and its base, from the vesical floor and outlet. Then if it be desired to remove the lobes separately, break through the anterior commissure, and, dividing the remaining connections, deliver the lobe through the urethral and perineal incisions. The same technic is repeated with the second lobe. If, on the other hand, it be planned to remove both lobes together, the finger sweeps over the anterior commissure without breaking it, and then applies the same manipulation to the other lobe. The general digital technic is suggested in Fig. 5237. The membranous urethra should not be ruptured in delivering the gland.

After the lateral lobes have been removed, if a median lobe be present, the covering mucous membrane is split, either medially above, or to one side, and the lobe is enucleated, or dissected out, or cut off _ using the space formerly occupied by the lateral lobes to bring it better within reach.

In these manipulations one should endeavor to avoid tearing the membranous urethra _ to avoid wounding the rectum _ and to avoid getting outside of the connective-tissue sheath of the prostate wherein lie the vessels which, when wounded, especially cause hemorrhage.

The perineal wound is not packed unless hemorrhage, which is unusual, occurs.

The postoperative bladder drainage carried out by Young (v. p. 56) is recommended here.

Sounds are begun on the sixth day, and are passed every second day for fourteen days.

Comment.—The difficulty of removing the entire gland is great, or impossible, in those cases in which the proper capsule of the prostate and the

Fig. 5237.—Illustration of the Finger Enucleation of the Prostate Gland _ showing the digital technic following penetration of the urethral wall. (Modified from Watson.)

sheath of the prostate are so intimately adherent that they cannot be separated without tearing into the extracapsular structures, with, generally, considerable wounding of vessels.

While the sides and roof of the prostatic urethra are generally torn, the floor of the urethra is especially preserved _ and, therefore, the ejaculatory ducts are not necessarily torn, though they sometimes may be.

PARTIAL PROSTATECTOMY BY THE COMBINED METHOD

BY MEDIAN SUPRAPUBIC CYSTOTOMY AND MEDIAN PERINEAL SECTION—ALEXANDER'S OPERATION

Description.—The prostate is first exposed through a regular suprapubic cystotomy incision for the purpose of examining the gland and to enable downward displacement of the prostate during the perineal operation _ and

the gland is then removed as far as required through the median perineal incision. The objects of the operation are to remove the obstructing portions of the prostate with the minmum damage to the bladder and urethra, and to furnish good drainage. The special method of Alexander involves the following anatomic features emphasized by its author (whose writing is largely followed in the subsequent description): — (*a*) The prostatic urethra consists of two parts: — (**1**) Vesical portion — which lies above the openings of the seminal ducts into the prostatic urethra; and which has thicker, stronger walls, permitting the freeing of the prostate without damage to the urethral mucous membrane. (**2**) Urethral portion — which lies below the openings of the seminal ducts into the prostatic urethra; and which has thinner, weaker walls, largely supported by prostatic tissue. (*b*) Fibrous trabeculæ extend from the central fibrous part of the prostate, behind the urethra, laterally outward to the fibrous capsule — dividing the lateral lobes into anterior and posterior parts by forming cleavage lines between them. (**1**) Anterior portion — placed in front of the fibrous trabeculæ, at the side of the urethra — which are the only parts of the lateral lobes whose hypertrophy causes interference with urination. (**2**) Posterior or inferior portion — placed posterior to the fibrous trabeculæ, posterior and inferior to the urethra and seminal ducts — the hypertrophy of which does not cause interference with urination. (*c*) Summary — the anterior portions of the lateral lobes whose hypertrophy causes urinary obstruction may, therefore, be enucleated *en masse*, without injury to the posterior portions or to the capsule.

Preparation.—Bowels emptied. Bladder irrigated and then distended with 8 or 10 ounces. Pubic and perineal regions shaved.

Position.—Patient as for suprapubic cystotomy during the opening of the bladder — and in the lithotomy position during the perineal incision. Surgeon to patient's left at first — and then seated opposite the perineum. Assistant at first opposite Surgeon and then to his right.

Landmarks.—Those for Suprapubic Cystotomy (Vol. V, p. 525) and for Median Perineal Cystotomy (Vol. V, p. 550).

Incisions.—Same as for Median Suprapubic Cystotomy and for Median Perineal Section.

Operation.—A median suprapubic cystotomy is done — making an opening into the bladder large enough to insert the index-finger. The lips of the bladder wound are temporarily sutured to the lips of the abdominal wound by one or two stitches on each side. The intravesical portion of the prostate is examined. The bladder wound is then protected with gauze.

A fairly large, centrally grooved sound is then passed into the bladder from the meatus of the penis — and steadily held in the middle line by an Assistant. The median perineal section is made just as in Syme's operation (Vol. V, p. 668) — exposing the membranous urethra. Its floor is divided upon the grooved sound from just posterior to the bulb in front to the apex of the prostate gland behind. As the sound is being withdrawn the finger is passed into the bladder through the prostatic urethra, which is dilated by the finger.

The left index is introduced through the suprapubic wound into the bladder — and presses the prostate firmly toward the perineum, to bring it as fully into the perineal wound as possible. The right index passes through the perineal wound into the prostatic urethra and begins the enucleation of the prostatic gland tissue — beginning by feeling along the lateral aspect of the prostatic urethra for the prominence caused by the inward bulging of the enlarged lateral lobe. The mucous membrane is broken through by the finger just in front of this eminence caused by the intrusion of the lateral lobe. The

finger then works its way along the cleavage line of the fibrous trabeculæ between the anterior and posterior parts of the lateral lobe. The obstructing part of the lateral lobe is separated with comparative ease laterally and posteriorly from the posterior portion of the gland and capsule. The obstructing mass is then separated from the mucous membrane at the neck of the bladder and from the superior part of the prostatic urethra _ aided by being grasped with forceps and drawn toward the perineal wound _ while the left index in the bladder aids in guarding the mucous membrane against being torn. The procedure just described upon one lateral lobe is repeated upon the other lateral lobe if indicated.

If an enlarged "middle lobe" exist, it is pressed down by the finger in the bladder into the perineal wound, into the area formerly occupied by the enucleated lateral lobes, when it is also enucleated in the same way from beneath the mucous membrane and without further injury to the mucous membrane _ by sweeping the finger around through the space left by enucleating the lateral lobes. Thus the only part of the urethra which is torn during the operation is that portion just anterior to the opening of the seminal ducts. And no injury is done to the bladder or urethral mucous membrane except that done to the mucous membrane of the prostatic urethra distal to the openings of the ejaculatory ducts.

Hemorrhage is controlled by hot water and gauze pressure. The bladder and perineal wounds are irrigated with hot salt solution. A stout rubber catheter is passed into the bladder through the perineal wound _ and another rubber drainage-tube is inserted into the bladder through the suprapubic wound. The suprapubic bladder wound is sutured about the tube by Gibson's method (Vol. V, p. 560) _ similar in principle to Kader's gastrostomy method. The perineal wound is partly closed by suture. The bladder is irrigated daily. The suprapubic tube is generally removed in four days and the perineal in seven _ complete healing of both wounds being expected in about five weeks.

Comments.—The perineal hemorrhage may require temporary gauze packing.

Guard against injury to the rectum, especially during work near the anterior portion of the prostatic urethra.

In conjunction with the regular suprapubic cystotomy some Surgeons make the transverse curved perineal incision. The prostate is exposed through the suprapubic bladder wound and depressed through the bladder into the perineum. The capsule of the gland is then divided transversely through the perineal wound and enucleated by this route.

Subsequent to the introduction of the Alexander technic, which was the outgrowth of the Belfield and Nicoll procedures, the transvesical portion of the operation is sometimes omitted.

PARTIAL PROSTATECTOMY IN SOME LIMITED FORMS OF OBSTRUCTION BY THE INTRA-URETHRAL PUNCH METHOD

YOUNG'S TECHNIC

In some such limited and irregular forms of urethral obstruction as median bar formation, submucous fibroids, hyperplastically enlarged suburethral and subtrigonal glands, nodules resulting from inflammatory conditions, and the like _ rather than in true prostatic hypertrophy _ the obstructing tissue is sometimes punched out by a special type of instrument introduced through the intra-urethral route.

Young's urethroscopic median bar excisor consists of a hollow, windowed

sound, with urethroscopic attachment _ and obturator, to be used during its introduction _ and a cutting tube, to be pushed down the first tube after the withdrawal of the obturator, with which the obstruction, engaged in the window of the original tube, is cut off.

The patient is placed in the lithotomy position _ after which the urethra and the bladder are analgesiated with cocain solution _ and the bladder is distended with fluid. The tube, with obturator in position, is introduced _ after which the obturator is withdrawn _ and the bladder and urethra examined by reflected light. The instrument is then manipulated, backward and forward, with or without lateral revolution, until its window engages the obstructing growth _ when the tube with cutting edge is slipped down within the outer tube _ and cuts off or punches out the mass which has passed into the lumen of the first tube through its window, which is upon its convexity (Fig. 5238). This single punching out may suffice _ but if not, other portions of obstructing tissue may be similarly engaged and similarly cut off _ until, finally, the Surgeon is satisfied that the urethral blockage has been sufficiently removed.

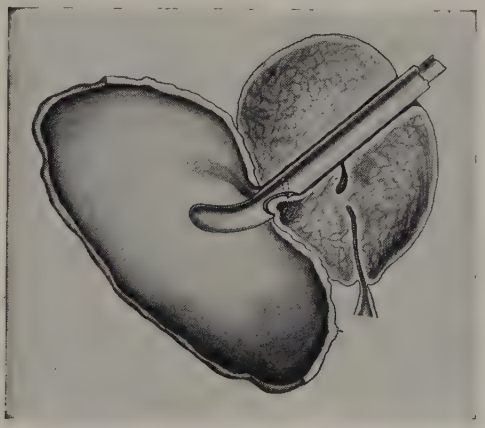

Fig. 5238.—Partial Prostatectomy in Median Bar Obstruction by the Intra-urethral Punch Method _ Young; _ Seen in sectional view.

Upon completing the operation the bladder is irrigated with hot boric solution. A stout-walled rubber catheter is then introduced _ one of sufficient size to exercise hemostatic pressure upon the tissues at the site of operation. This is left *in situ* _ and through it the bladder is irrigated and the clots, if any, washed out.

TRANSURETHRAL PROSTATOTOMY BY GALVANOCAUTERY FOR PROSTATIC OBSTRUCTION

Description.—The employment of a special form of galvanocautery prostatome for the division of urethral obstruction caused by hypertrophy of the prostate gland was formerly more frequently employed than at present. The method is an in-the-dark one _ the danger associated with its employment is considerable _ and the relief secured is, from the nature of things, apt to be temporary. The procedure may be classed as a palliative measure, sometimes indicated where more radical measures are, for one reason or another, contraindicated _ as, for example, where the patient's general condition

of health is too much broken down for the more major procedures, or where the local condition is such, as from malignancy of the prostate and adjacent structures, to render any radical operation useless _ and where all that can be expected is to secure some degree of betterment of the local obstruction, even if it cannot be but temporary, or, if from the patient's bad condition, its need seem but temporary.

Several technical procedures with the galvanocautery have been worked out _ the chief of which will be here briefly described. If it be possible to do so, a urethroscopic and cystoscopic examination should be carried out in

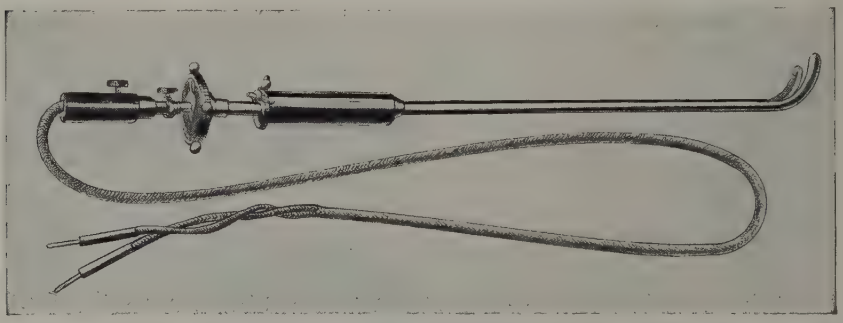

Fig. 5239.—Young's Modification of Bottini-Frendenberg's Prostatome; _ The cold-water tubes to reservoir are not shown.

advance of using any form of galvanocautery in order to post one's self as to the local conditions to be encountered. The condition of bladder and urethra should also be preliminarily gotten into as good a condition as possible _ as well as the general health.

Transurethral, Intravesical Prostatotomy (Bottini).—Several forms of galvanocautery prostatomes have been devised. A simple type is seen in Fig. 5239. In Fig. 5240 is shown an improved type of instrument, with water cooling attachment. Ability to pass the instrument through the urethra is, of course, a prerequisite to its use. The bladder, previously cleansed as

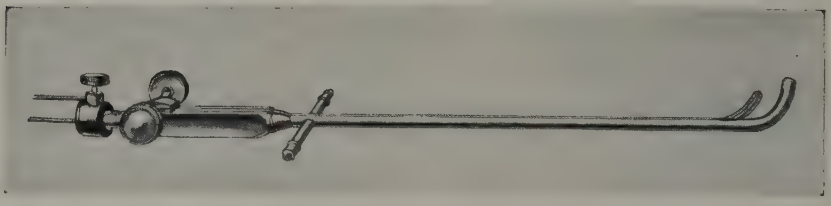

Fig. 5240.—Electric Prostatome _ (from an unplaced source).

well as possible, is usually filled to the extent of 4 or 5 ounces of fluid _ which has been known to get too hot in some cases where no water-cooling type of instrument was employed. And in a case where air was substituted for water in distending the bladder the bladder wall was ruptured by explosion, with death of the patient a few days later.

The instrument is passed down the urethra and into the bladder. A finger in the rectum will add steadiness to the instrument as it cuts through the prostate. The beak of the instrument is turned downward _ the cautery blade sprung _ the current turned on _ about fifteen seconds given for white

heat to be reached – after which the cautery blade is drawn through the floor of the prostate (by the special device at the handle of the particular instrument) – at the rate of about 1 cm. (6/16 inch) per minute. During these maneuvers

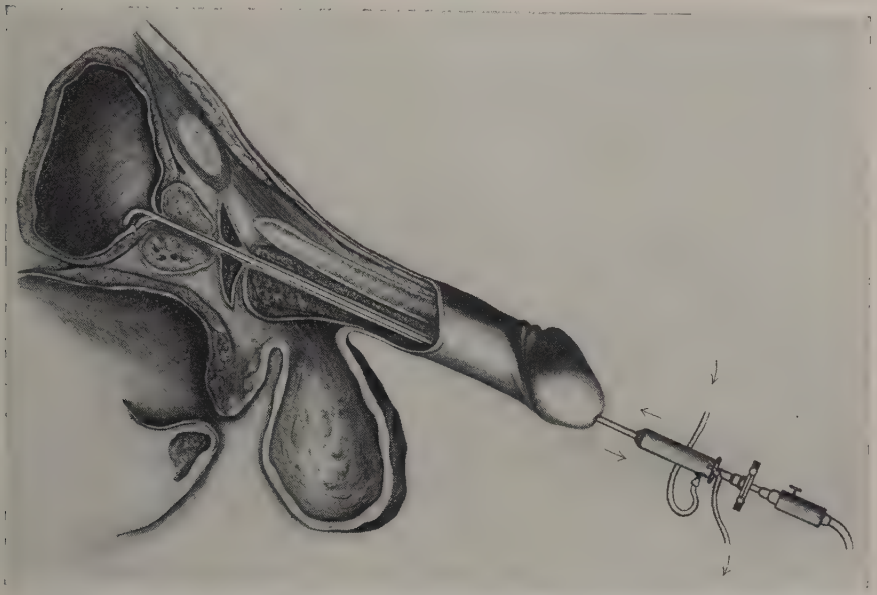

Fig. 5241.—Intravesical Galvanocautery Prostatotomy – Bottini; – The opened blade of the prostatome is seen cutting its way through the floor of the prostatic urethra. The water-currents are shown by the arrows.

the instrument is held steadily in one position rigidly, so that the blade that has been drawn forward through one burned pathway may be returned, backward, through the same pathway (as, otherwise, difficulty might be

Fig. 5242.—Appearance From Within the Bladder of Transverse and Axial Section of Obstructing Portion of Prostate Gland by Galvanocautery Prostatome.

experienced in finally locking the blades and withdrawing the instrument). The technic is shown in Fig. 5241. It is important that the blade should not be drawn beyond the prostate, as the membranous urethra would be burned

through. In average cases it is stated that about 4 cm. ($1\frac{9}{16}$ inches) of extent of prostatic tissue is traversed in burning through the lateral lobes. If in the maneuvers the blade be bent (as may happen from too rapid or rough action), it would be difficult or impossible to return it to its sheath _ and,

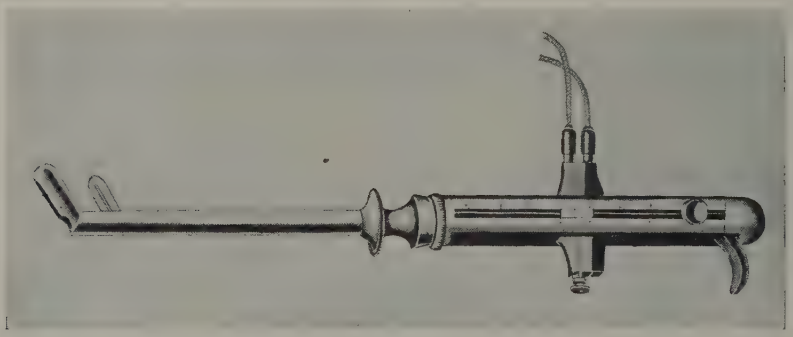

Fig. 5243.—Cheetwood's Prostatic Incisor

therefore, difficult or impossible to withdraw the instrument through the urethra. If indicated two, three, or four cuts or burnings may be made, as seen in Fig. 5242 _ always returning the blade back to its original position before advancing it for the next cut.

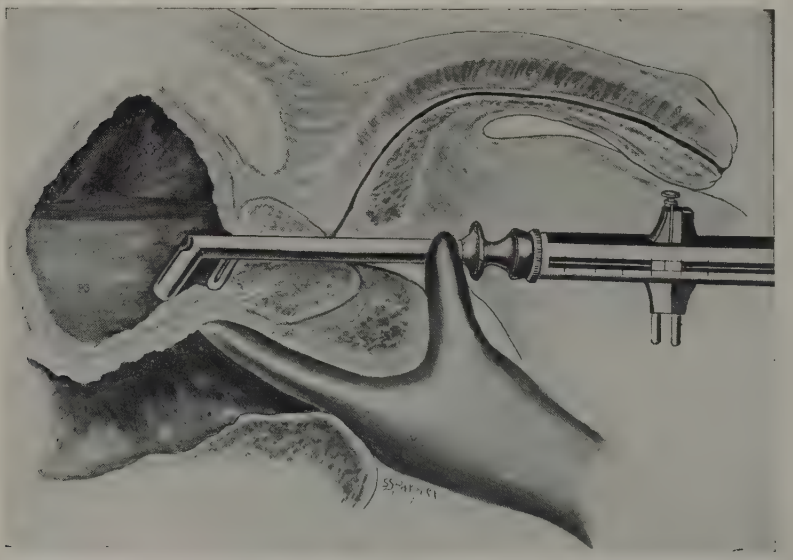

Fig. 5244.—Perineal Galvanoprostatotomy _ Cheetwood; _ The instrument has been introduced through a perineal wound _ and, guided against the prostate by a finger in the rectum, the blade is made to cut its way forward through the obstructing portion of the gland. The site of attachment of the electric control and cold-water supply is shown.

Transperineo-urethral, Intravesical Prostatotomy by Galvanocautery (Cheetwood's Modification of Bottini's Operation).—In this procedure a modification of the Bottini prostatome is used (Fig. 5243). And instead of carrying the instrument through the entire length of the urethra, a median

perineal external urethrotomy upon a grooved sound is first performed — and through the perineal and urethral incision thus made the prostatome is carried into the membranous and through the prostatic urethra into the bladder. Guided then by a finger in the rectum — and carrying out the same instrumental technic described above — the inverted, white-hot blade of the instrument is brought against the posterior aspect of the prostate and made to burn its way through — as seen in Fig. 5244. After burning the first pathway the blade may be returned and one or more additional tracts burned through, as in the preceding operation.

A finger should be introduced through the urethral incision into the bladder and an examination of the parts be made before introducing the instrument. If the operation as planned cannot be carried out, this method of procedure admits of then carrying out a partial or complete perineal prostatectomy.

CHAPTER LXXXIV

OPERATIONS UPON THE FEMALE URETHRA

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Urethroscopy, p. 92; _ Passage of sounds and catheters through the female urethra, p. 92; _ Dilatation of the female urethra, p. 93; _ Internal urethrotomy for stricture of the female urethra, followed by dilatation, p. 95; _ External vaginal urethrotomy, p. 95; _ Urethroplastic repair of a strictured urethra by axial incision and transverse suturing, p. 97; _ Urethrorrhaphy, p. 98.

Operations for tumors of the female urethra, p. 98; _ Exposure of the ducts of Skene for injection or incision, p. 99; _ Incision of Skene's ducts, p. 101.

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Operation for prolapse of the urethral mucosa at the meatal outlet, p. 106; _ Restoration of a urethra, the anterior part of the floor of which has sloughed, p. 108; _ Restoration of a urethra, the anterior portion of which has been destroyed, the remainder of the lumen communicating with the roof of the vagina by a contracted orifice, p. 109; _ Restoration of the partially absent urethra by combined inverted and superimposed lateral vaginal flaps, p. 111; _ Restoration of the totally absent urethra by inverted median vaginal flap (Noble), p. 112.

Operations for incontinence of urine in the female, p. 113.

Urethrovaginal fistulæ, p. 118.

Operations for epispadias in the female, p. 118; _ Operations for female hypospadias, p. 119.

Total urethrectomy in the female, p. 119.

ANATOMY OF THE FEMALE URETHRA

Description.—About 3.2 to 3.8 cm. ($1\frac{1}{4}$–$1\frac{1}{2}$ inches) in length _ from neck of bladder to external urinary meatus. Its diameter is about 6 mm. ($\frac{1}{4}$ inch), undilated. It pierces the triangular ligament and is directed upward and backward, with concavity slightly forward. It is surrounded anteriorly and laterally by a plexus of veins (plexus of Santorini). It lies under the symphysis pubis _ its posterior wall being closely connected with the anterior wall of the vagina. The bladder opening lies about 2 cm. ($\frac{3}{4}$ inch) behind the center of the symphysis pubis. The external urinary meatus is a vertical slit lying about 2.5 cm. (1 inch) posterior to the clitoris, just anterior to the entrance of the vagina, and inferior to the lower edge of the symphysis pubis. The female urethra is composed of muscular, erectile, and mucous tissue _ and is embraced by the compressor urethræ muscle, between the layers of the triangular ligament.

Vessels and Nerves.—From the same source as those of the vagina (*q. v.*).

Skene's Glands and Ducts.—For description see Exposure of the Ducts of Skene, p. 99.

URETHROSCOPY

Described under Cystoscopy (v. Vol. V, p. 507).

THE PASSAGE OF SOUNDS AND CATHETERS THROUGH THE FEMALE URETHRA

In passing an instrument through the female urethra, from the meatus into the bladder, the patient lies supine, with the hips and knees semiflexed and the thighs separated. The lips of the labia are parted with the left thumb and index.

Holding the instrument between the right thumb and index, the index slightly in advance of the instrument, pass the tip of the right index just within the vaginal orifice – withdraw the finger partly, hugging the upper wall of the vagina – and, as the finger glides out of the vagina, upon the vestibule, the prominent urethral papilla is felt (about 1.3 cm., or $\frac{1}{2}$ inch) above the junction of the vagina and vestibule – upon which is situated the meatus – into which the instrument is then introduced – and is carried on thence through the urethra into the bladder.

The above technic is especially advisable whenever there is any difficulty in recognizing the position of the meatus – and it is surprising how difficult catheterization may sometimes be – and, indeed, how difficult it may be even to find the meatus when the parts are disturbed by pathologic or surgical conditions.

Fig. 5245.—Catheterization of the Bladder – left fingers parting the vaginal lips – right fingers guiding a glass catheter.

In normal conditions it is ordinarily not necessary to touch the part with the fingers at all – after separating the vaginal lips with the left thumb and index.

The general technic is shown in Fig. 5245.

Catheterization was formerly often performed in the dark under cover – an unwarrantable procedure.

DILATATION OF THE FEMALE URETHRA

Stricture of the female urethra rarely presents any approach to the serious features so frequently encountered in connection with stricture of the male urethra. When present, strictures here are usually due to urethritis, syphilis, malignancy, traumatism, or to cauterant applications.

The methods of treatment usually adopted are: — dilation, incision, or excision — or, if none of these can be adopted, some form of bladder drainage.

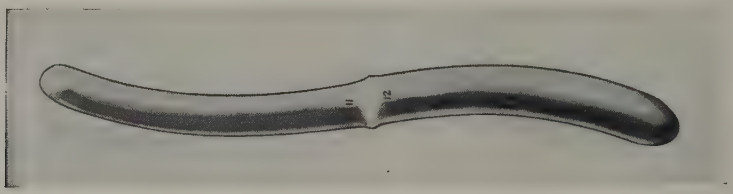


Fig. 5246.—Double-ended Urethral Dilator — in sixteen sizes, from 5 to 20 mm.

Dilatation is generally carried on either by instruments of increasing sizes, such as seen in Fig. 5246, — or by an instrument of conical outline, as shown in Fig. 5247.

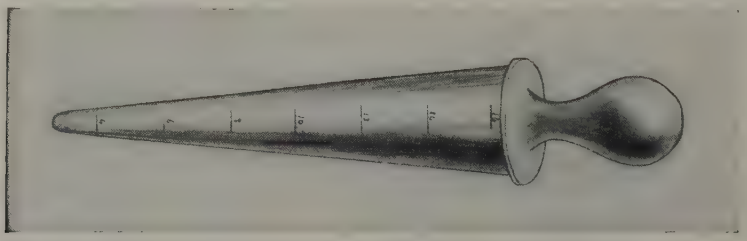


Fig. 5247.—Kelly's Conical Urethral Calibrator and Dilator.

The technic of dilatation is simple — and is, practically, the same as that employed in the passage of catheters and sounds through the female urethra (v. p. 92).

Fig. 5248.—Dilating the Urethral Orifice and Canal — with Kelly's calibrated conical dilator.

Where difficulty or discomfort is anticipated, sensitiveness should be deadened by the application of cocain solution to the mucosa by means of cotton twisted upon an applicator. The rate of progress made in the dilatation

will depend, of course, upon the degree of narrowing and upon the nature of the case — extending from several days to several weeks. One begins with an instrument which snugly engages the urethra — and passes thence, by graduation, up, in an average case, to a maximum dilation represented by an instrument of 10 mm. (6/16 inch) in diameter. The average glass catheter is usually from 4 to 5 mm. in diameter.

In dilating urethræ where the narrowing extends over a relatively large extent of its length, or is situated proximal to the meatal orifice, even if of limited extent, an instrument of even diameter throughout should be used.

In dilating a stricture limited to the meatal orifice a conical form of dilator may be employed in the manner suggested in Fig. 5248.

Hard-rubber dilators may be employed instead of metallic ones.

While gradual dilation is here preferable to rapid dilatation, as also holds in the case of the male urethra, there may be limited strictures (involving but a limited extent of urethra), of moderate constriction, upon which rapid dilatation (by the consecutive passage of instruments of increasing diameters) under anesthesia might be applied — provided the splitting of the urethral wall into the connective-tissue bed be avoided.

INTERNAL URETHROTOMY FOR STRICTURE OF THE FEMALE URETHRA, FOLLOWED BY DILATATION

Internal urethrotomy may be considered to hold an intermediate position between dilatation (v. p. 93) and excision (v. p. 119). In cases which do not yield to dilation incision should, as a rule, be resorted to — before adopting excision.

The method of applying internal urethrotomy near the meatus is to introduce a fenestrated urethral endoscope or urethral speculum, and to make, by means of a long, narrow knife, a number of parallel, superficial incisions into but not through the wall of the urethra. The speculum is then withdrawn, and several increasing sizes of sounds or hard-rubber bougies are passed in succession — avoiding rupture of the urethra.

The use of multiple, superficial axial incisions — made through the lateral window of the speculum, as it is revolved, whether in the proximal or distal urethra — is better technic than to make a single, deeper incision — as the latter, when the urethra is dilated, is more apt to tear through the remaining wall of the canal.

In dealing with strictures not accessible from the meatus the same methods may also be applied as in dealing with the corresponding condition in the male (v. Vol. V, pp. 646–668) by internal urethrotomy accomplished by one of the several forms of urethrotome.

EXTERNAL VAGINAL URETHROTOMY

Incision of the urethra through the vaginal route is usually performed for the removal of a calculus impacted within the urethra — or for impermeable or very tight stricture of the urethra not relievable by other means. Two methods of procedure will be mentioned.

Vaginal or Submeatal External Urethrotomy.—In this, the more usual operation, the inferior wall of the urethra is exposed and incised, through the anterior wall of the vagina below the meatus. If a grooved sound can be passed through the urethra the procedure is easier. The sound, however, can usually be passed at least down to the obstruction, when the technic becomes similar, in principle, with the corresponding procedure in the male (v. Vol. V, p. 675). An anterior median incision is made down the wall of the vagina, beginning below

the meatus, and extending, in depth, down to the urethra. The two lateral lips of the vaginal wound are mobilized and are retracted outward, exposing the urethra _ into the middle line of the inferior wall of which an axial incision is made, opening into the lumen of the canal (Fig. 5249). If any prolonged technic be indicated the two lips of the urethral incision are controlled by thread tractors during the manipulation. In those cases in which closure of the urethra is not contra-indicated, when the object of the undertaking has been accomplished, the lips of the urethral wound are brought together by fine chromic catgut stitches, which do not penetrate into the lumen of the

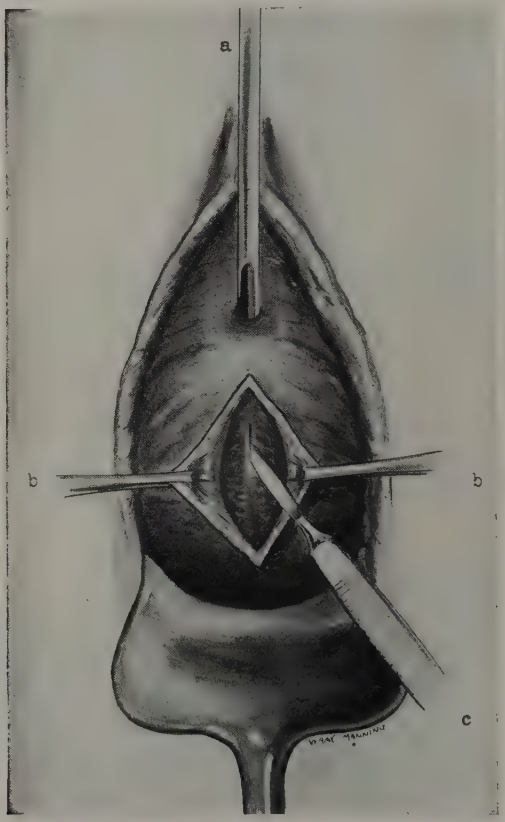


Fig. 5249.—Vaginal or Submeatal External Urethrotomy _ I: _ a, Grooved staff in bladder, or down to the obstruction; _ b, b, tractors of the lips of the vaginal wounds; _ c, incising the urethra.

canal _ as shown in Fig. 5250. The vaginal wound is then sutured up to the exit of a small temporary drain.

Vestibular or Suprameatal External Urethrotomy.—The superior wall of the urethra is here exposed and incised through the anterior wall of the vaginal vestibule above the meatus _ and not, as erroneously shown in the illustration, below it. A transverse incision, with slight forward convexity, is carried across the vaginal vestibule, midway between the clitoris and the meatus. The margins of the incision are sufficiently mobilized to allow them to be retracted, as seen in Fig. 5251. The dissection is carried on beneath the pubic arch _ until the superior wall of the urethra is exposed _ and which is

then incised axially. At the end of the operation, and unless it be contraindicated, the lips of the urethral wound are brought together by fine non-

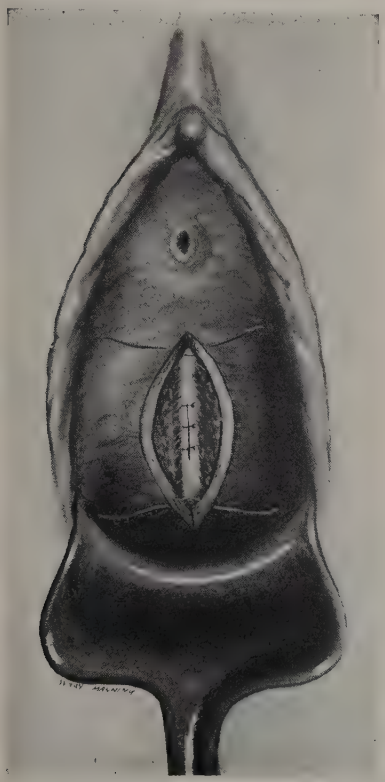


Fig. 5250.—The Same — II; — Suturing the urethra with non-penetrating stitches. Sutures of the overlying vaginal wall.

Fig. 5251.—Vestibular or Suprameatal External Urethrotomy; — Retraction of margins of transversely curved incision (convexity forward) midway between the clitoris and meatus. Incision of the urethra above the meatus is shown. *Note:* A gross error is here depicted — the same incisions here shown should, instead, be placed between the clitoris and meatus — not below.

penetrating chromic catgut sutures. and the vaginal wound closed up to the exit of a small temporary drain, as in the above operation.

URETHROPLASTIC REPAIR OF A STRICTURED URETHRA BY AXIAL INCISION AND TRANSVERSE SUTURING

This method of procedure is sometimes employed in cases of strictured urethra — and consists in the transverse suturing of an axial incision through the wall of the urethra (corresponding, in principle, with the operation of pyloroplasty for stricture of the pyloric orifice of the stomach).

In the operation already described, of external vaginal urethrotomy for stricture, the steps of the procedure are there the same as here — except that, in concluding the operation, instead of suturing the lips of the urethral incision back into their original axial position, they are sutured transversely — thus increasing, at the site of suturing, the lumen of the urethra.

URETHRORRHAPHY

The suturing of the female urethra is the same, in principle, as urethrorrhaphy in the male (v. Vol. V, p. 640). The salient feature is the employment of sutures which do not penetrate into the lumen of the canal. Fine chromic catgut is probably the best suture material – though fine silk is preferred by some. It is well to have a small temporary drain pass from the site of the sutured urethra through the skin wound, which is sutured up to its exit. Where sutures which penetrate into the lumen have, for one reason or another, been employed, drainage should, unquestionably, be employed – for a time sufficiently long to demonstrate whether urinary leakage from the urethra is occurring.

The sutures are applied as already indicated in Fig. 5250. The application of the stitches is made easier if a sound can be passed through the canal.

OPERATIONS FOR TUMORS OF THE FEMALE URETHRA

The benign tumors of the urethra usually encountered are the following, – cysts; granulomata (inflammatory granulation tissue, faced with stratified

Fig. 5252.—Removal of a Slenderly Pedunculated Urethral Tumor by Ligation and Division; – The lips of the urethra are retracted and the growth exposed – with its pedicle ready to be ligated (with or without incision of the overlying mucosa) and cut – or simply tied.

squamous epithelium); urethral "caruncles," which may be angiomata, papillomata, or adenomata, dependent upon whether the vascular, epithelial, or adenomatous tissue predominates; fibromata; myomata.

The malignant tumors are carcinomata and sarcomata.

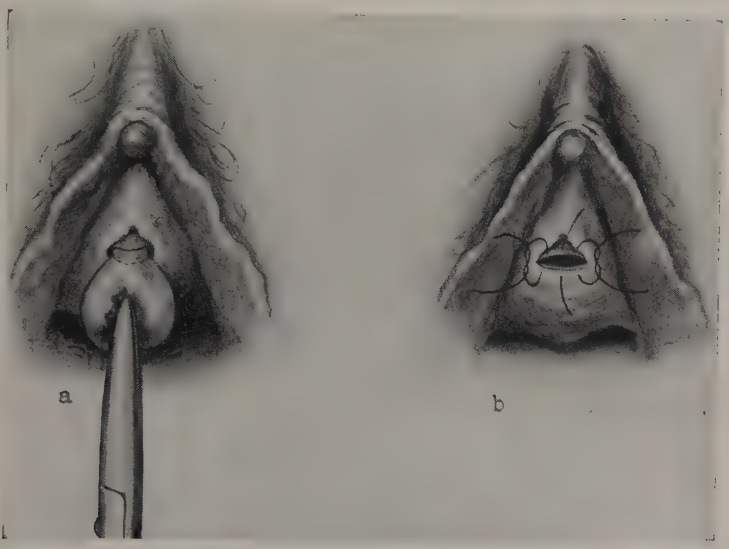
The nature of tumors situated well within the urethra should be preliminarily determined, as far as possible, by urethroscopic examination – and, prior to manipulation, the canal should be dilated if this can be carried out. As of fortunate aid, as to their removal, innocent tumors of the urethra are usually pedunculated or pear shaped.

Pedunculated tumors whose pedicle is well within the canal may be seized with clamps and, while drawn downward, be cut off at their base – which, if accessible, may be cauterized. Or, if bleeding occur from the base,

pressure with a cotton applicator dipped in adrenalin solution may be used – or a cold or a hot metallic sound held in position for a few minutes.

If the pedicle of a pedunculated tumor be accessible, it may be ligated with fine catgut, and then, especially if slender, cut with scissors – as in Fig. 5252.

If a pedunculated tumor have a pedicle which may be reached, and is rather bulky, and, therefore, more apt to bleed, it is better practice, where the method can be carried out, to excise the tumor at its base by means of an encircling incision of elliptic outline (Fig. 5253, **a**) – after which the opposite margins of the wound are brought together by two or three fine catgut sutures (Fig. 5254, **b**).



Figs. 5253 and 5254; – Excision of a Stoutly Pedunculated Urethral Tumor, Followed by Suturing: – **a**, The pedicle of the tumor is exposed by traction of the clamp buried in its substance – the elliptic excision of the pedicle being shown; – **b**, the resulting wound in the act of being sutured.

In malignant involvement of the urethra all operative measures should be radical if undertaken at all. Part or all of the urethra should be excised (v. p. 119) – together with the inguinal lymphatic glands.

EXPOSURE OF THE DUCTS OF SKENE FOR INJECTION OR INCISION OF THEIR MOUTH

The para-urethral ducts, or the tubes of Skene, are from 1 to 2 cm. (6/16–9/16 inch) in length. They are regarded as homologous with the prostatic ducts – and constitute the excretory channels of a small group of tubular glands lying to the outer sides of the lateral walls of the female urethra. The duct of each side usually opens by a minute mouth upon a papilla upon the lateral wall of the urethra, near to the posterior border of the urethral orifice. Sometimes the ducts open upon the posterior urethral wall just inside of the external urinary orifice. They are generally found in the indicated position after drawing to either side the two tiny urethral lips.

The ducts may become distended through obstruction of their outlets – or the glands which they drain may become infected – requiring either irrigation or incision.

Owing to the smallness of the parts and their relative inaccessibility all manipulation and instrumentation must, naturally, be upon a small and delicate scale. Kelly's method of exposing the intra-urethral openings of the ducts – by means of bent hairpins held by hemostats as tractors – is clever. A specially small wire speculum, of the nasal type, may be found useful. The urethral mucosa is first deadened by means of a local application of cocain solution – after which the special or improvised type of retractors is introduced – and the mouths of Skene's ducts exposed (Fig. 5255).

In examining the ducts a fine probe is carried through their orifices and along their course.

In aspirating distending fluid the broken-off and file-smoothed needle, attached to the barrel of a hypodermic syringe, may be used – producing a

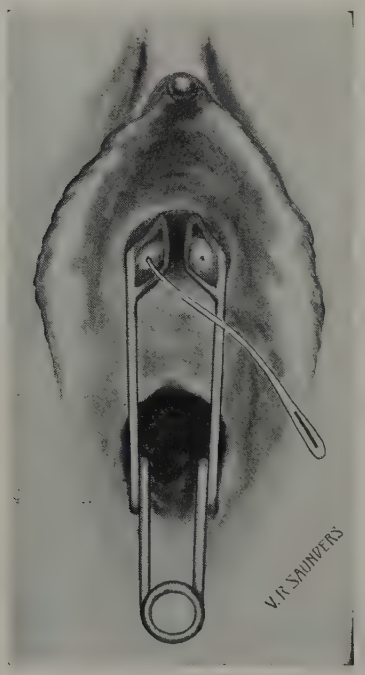


Fig. 5255.—Exposure of the Anterior Portion of the Urethra and the Orifices of the Para-urethral Ducts by Means of Skene's Modification of Folsom's Nasal Speculum; – A probe is seen entering Skene's duct on the left. The same object can be accomplished with bent hair-pins – as in Kelly's technic.

vacuum in the syringe barrel after the needle has been passed into the duct and to the required depth.

In injecting such solutions as those of boric acid, silver salts, or pure carbolic acid the needle is withdrawn, the aspirated fluid expressed from the syringe (if aspiration have been previously employed), and, again introducing the blunted needle, a drop or two of fluid is injected into the duct, whose capacity for holding fluid is very limited.

In incising the distal end of the duct a fine grooved director – such as used in eye-duct surgery – may be carried into the duct, and upon this a very fine knife is carried, splitting the duct toward the outlet of the urethra. Or a fine probe-pointed canaliculus knife may be carried directly into the duct.

INCISION OF SKENE'S DUCTS

In some cases of infection of Skene's glands in which injections, as just described (v. p. 99), have been unsuccessfully employed, it may be indicated, especially in suppuration, to lay open the duct of these glands and thus gain better drainage.

The vaginal mouth of the involved duct is exposed in the manner already described, and a fine probe-pointed canaliculus knife is carried into the duct – which is then slit open to the desired extent.

OPERATION FOR ACUTE SUBURETHRAL ABSCESS

Suburethral abscess occurs between the floor of the urethra and the anterior vaginal wall (Fig. 5256). The axis of the abscess cavity corresponds with the urethral axis, and the tumor, usually commencing 1 or 2 cm. (6/16–

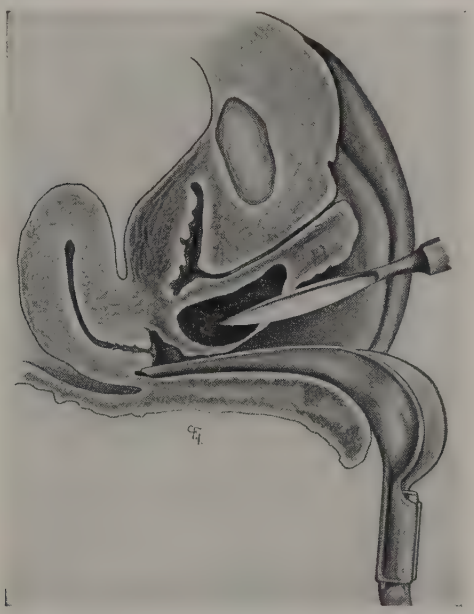


Fig. 5256.—Sectional View of A Suburethral Abscess; – Its communication with the urethra not being here visible. The posterior vaginal wall is shown depressed by a retractor, exposing, for incision, the pus cavity between the urethra and the anterior vaginal wall. (The knife is disproportionately large.)

13/16 inch) behind the meatus, may be as large as a hen's egg. These abscesses generally have their origin either in traumatism of the urethral wall, or in infection of some of the peri-urethral glands constituting, in either case, an acute abscess.

The chronic phase of this condition is sometimes termed urethrocele (v. p. 102), chronic abscess of the female urethra, and the like – a condition sometimes lasting indefinitely, even over years and characterized by periodic emptying of the suburethral pocket into the urethra, and the evacuation of the contents thence *via* the meatus. Treatment of the chronic form of the condition is described at the site to which reference has been above given.

The treatment of the acute condition is, practically, that of an abscess in general – namely, incision and drainage. The posterior vaginal wall is retracted, the surface of the tumor is deadened with an application of cocain

solution _ and the pus sac is laid open in the median line freely. The interior of the sac is brushed over with carbolic acid, followed by alcohol _ or with tincture of iodin _ and packed with gauze.

In some instances this course alone will result in cure.

Sometimes an elliptic piece is excised from the floor of the pus sac, together with the preceding treatment, and the site allowed to heal by granulation.

In other instances an attempt may be made to dissect out the unopened pus sac, ligate its connection with the urethra, and close the urethral communication by suturing.

In still other cases it may be best to first simply incise and drain _ and then, later, while the wound is still present, dissect out the sac wall, if one have formed _ and close the urethral communication, if one be present.

OPERATIONS FOR URETHROCELE

Urethrocele consists of a saccular or pocket-like dilatation of the posterior urethral wall at about its middle _ its presence often being manifested

Fig. 5257.—Sectional View of Urethrocele.

by a corresponding bulge of the anterior vaginal wall (Fig. 5257). It may result from injury during childbirth _ or be the persistence of the cavity of a suburethral abscess which has ruptured into the urethra _ or be due to some unexplained cause.

The presence of the condition may be corroborated by conjoint manipulation, carried on between a sound passed into the sac, *via* the meatus and urethra, and an index-finger introduced into the vagina _ the sound being felt by the intravaginal finger, as its tip is outlining the contour of the sac (Fig. 5258).

Operation for Urethrocele by Excision of the Sac.—The technic here consists in making an axial incision through the anterior wall of the vagina, upon the end of the sound which has been introduced into the sac, and made prominent by its pressure toward the vagina. The sac is exposed through the retracted margins of the vaginal wound and is dissected from its bed up to its cervical junction with the urethra. If this junction be very narrow, the neck may be ligated with fine catgut at the floor of the urethra and the sac be cut off. Or a larger neck may be simply cut through just below the level of the floor of the urethra. In either case the tissues forming the bound-

ing walls of the sac, between the floor of the urethra and the roof of the vagina, are brought closely together by means of buried catgut sutures – which do

Fig. 5258.—Operation for Urethrocele by Excision, – I; – Sectional view of a urethrocele, verified by the combined use of a probe within the pathologic urethral cavity and a finger within the vagina.

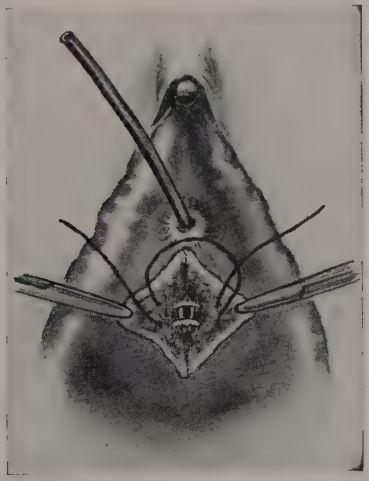


Fig. 5259.—The Same – II; – The sac of the urethrocele has been excised through the anterior vaginal wall, and its bed is being closed by buried sutures which do not penetrate the urethra, as well as by sutures of the vaginal mucosa.

not penetrate the urethral wall, but tightly compress the tissues just below the former urethral opening into the sac (Fig. 5259). The vaginal mucosa is then brought together by superficial suturing.

Operation for Urethrocele by Partial Excision of the Sac.—In those cases in which the contour of the urethrocele represents more of a general downward bulge of the floor rather than a jug-shaped sac communicating with the urethra by a definite, more or less constricted mouth, total excision of the urethrocele is, of course, impossible. In such instances the urethrocele is exposed by an axial incision made through the anterior vaginal wall upon a sound _ after which an elliptic segment of the bulged floor of the urethrocele (which constitutes the urethrocele) is excised _ by being seized with forceps and cut with scissors or with a knife _ after which the remaining margins of the urethra are sutured together. The vaginal wound is closed up to the exit of a small temporary drain. The general technic of the operation is shown in Figs. 5260 and 5261. Calculation must be made to plan the amount of urethral floor to be removed to leave enough urethral wall present to restore

Fig. 5260.—Operation for Urethrocele by Partial Excision _ I: _ **a, a,** Elliptic excision of the anterior vaginal wall (in a marked degree of urethrocele); **b, b,** elliptic excision of the floor of the dilated urethra; _ **c,** sound, from meatus to bladder, as a guide to the dilated urethra. The margins of the urethra are sutured. In minor grades of urethrocele the anterior vaginal wall is only incised.

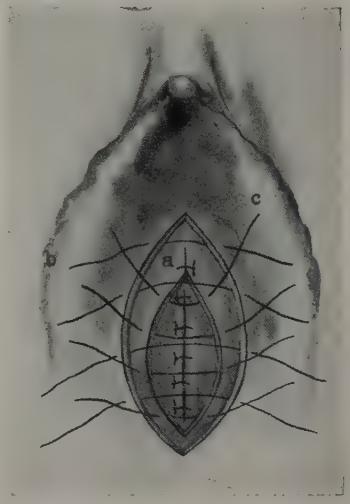


Fig. 5261.—The Same _ II; _ Buried sutures are seen uniting the margins of the urethral wound: _ **a, c,** Buried connective-tissue sutures, _ **b,** sutures of the vaginal mucosa.

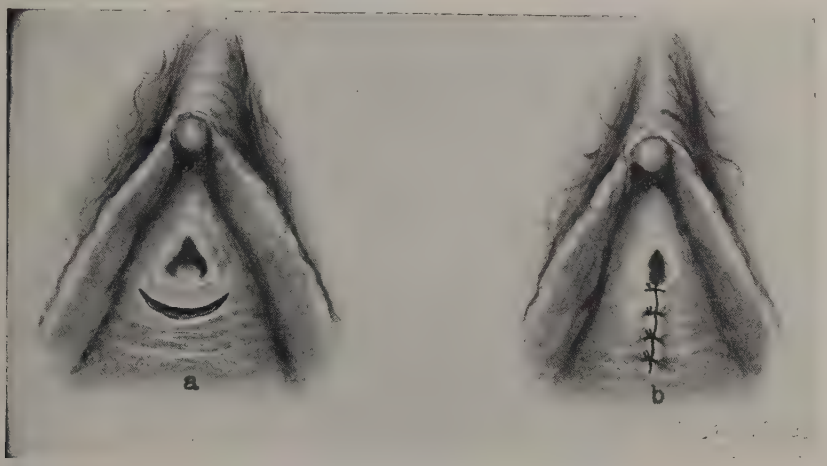
its normal dimensions. In marked degrees of urethrocele part of the anterior vaginal wall may also be excised.

OPERATIONS FOR THE RELAXATION OF THE FEMALE URINARY MEATUS

The urethral orifice of the female may be very much enlarged and relaxed _ sometimes sufficiently so to admit the end of the little finger. The condition has been known to follow, though rarely, forced dilatation of the urethra _ as after performing cystoscopy with a large instrument. Several methods of correcting the condition are employed.

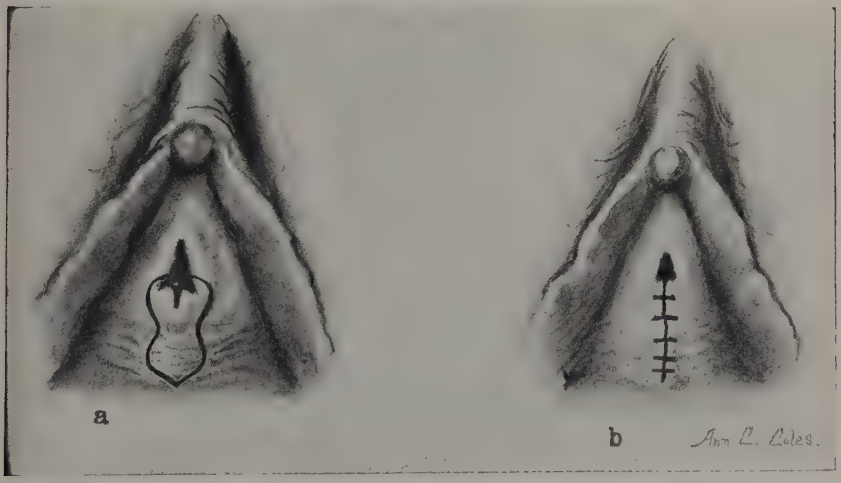
Operation for Relaxation of the Female Urinary Meatus by Submeatal Transversely Curvilinear Incision, Followed by Suturing in the Opposite Direction.—A transversely crescentic incision, with downward convexity, is made into the anterior vaginal wall from 12 to 15 mm. (7/16-

9/16 inch) in length, a short distance below the meatus (its distance from the meatus and its length being dependent upon the extent of the relaxation) – down to the urethra (5262, **a**). The margins of this incision are then sutured



Figs. 5262 and 5263.—Operation for Relaxation of the Female Urinary Meatus by Submeatal Incision, Followed by Suturing in the Opposite Direction: – **a**, Transverse semilunar incision, with downward convexity, made a short distance below the meatus; – **b**, the vertical suturing of the transverse incision.

in the reverse direction (that is, axially) – thereby tending to elevate the relaxed outlet by furnishing it a column of support (Fig. 5263, **b**).



Figs. 5264 and 5265.—Operation for Relaxation of the Female Urinary Meatus by Partial Excision of the Meatal Orifice and Anterior Vaginal Wall: – **a**, An elliptic piece is excised, including the posterior commissure of the meatus and the adjacent part of the anterior vaginal wall; – **b**, the margins of the wound are sutured vertically, giving a narrowed, reinforced support to the meatal outlet.

Operation for Relaxation of the Female Urinary Meatus by Partial Excision of the Meatal Orifice and Adjacent Anterior Vaginal Wall.—A more or less elliptic incision, with anteroposterior axis, is made to include

the posterior third or half of the meatal orifice (according to the amount of relaxation) _ together with a column of the submeatal anterior vaginal wall immediately adjacent (Fig. 5264, a). The lower margin of the meatus, mucosa, and superficial connective tissue within the line of incision is then excised, The margins of the resulting raw surface are then sutured together in an axial line (Fig. 5265, b).

EXCISION OF HYPERTROPHIED URETHRAL LIPS

A normal degree of prominence of these urethral lips, largely protective against urethral and vesical infection, is desirable. They may, however, be abnormally enlarged congenitally, pathologically, or by masturbation. If this be so, to the extent of their being impedimenta, their removal is simple.

Only the portion of the hypertrophied urethal lip, or lips, which is in excess of the normal (leaving protection of the urethral orifice) is to be excised. Its base is surrounded by an elliptic incision while the lip is held outward by forceps _ which is deepened slightly in wedge-shaped fashion in the process

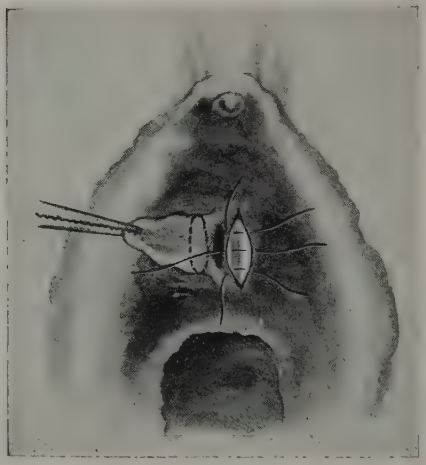


Fig. 5266.—Excising Hypertrophied Lips of the Urethra; _ On the right the base of the hypertrophied lip is surrounded by an elliptic incision preparatory to its excision. On the left the margins of the bed of the excised lip are being brought together by sutures.

of excision _ thereby removing the redundant portion. The opposite margins are then sutured with fine catgut.

In Fig. 5266 the line of elliptic incision is shown upon the right _ and the suturing of the lips of the excised bed on the left.

OPERATION FOR PROLAPSE OF THE URETHRAL MUCOSA AT THE MEATAL OUTLET

Operation is indicated in those cases of acute prolapse of the urethral mucosa which cannot be replaced under anesthesia, followed by elevated dorsal decubitus _ and in chronic cases of prolapse. The condition is shown in Fig. 5267.

The principle of procedure is to excise the prolapsed and more or less hypertrophied tissues, and then suture the margins of the cut urethra to the margins of the vaginal wound.

The exuberant tissues are clamped and drawn outward _ and while thus

held their base is transfixed transversely by a curved needle held in a holder and armed with fine chromic catgut (Fig. 5268). The redundant portion of tissue, distal to the transfixing suture, is then excised with scissors or knife.

Fig. 5267.—Operation for Prolapse of Urethral Mucosa – I; – Showing the excess of urethral mucosa to be excised.

The portion of the suture lying within and crossing the lumen of the divided urethra is then seized and drawn outward, after which the loop is divided – thus making two sutures. As many such sutures may now be placed as con-

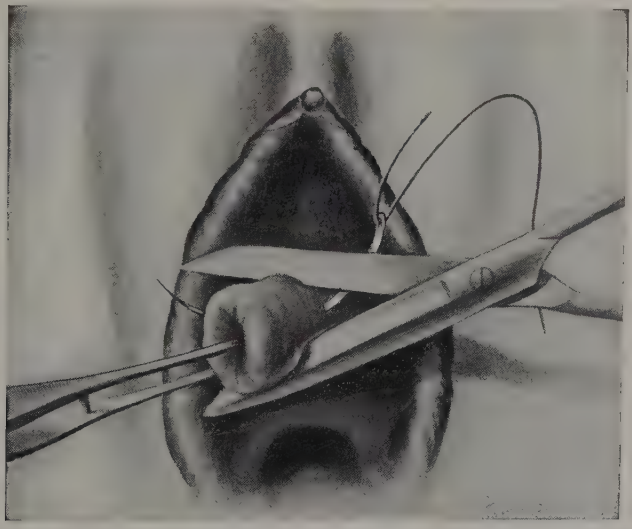


Fig. 5268.—The Same – II; – Showing an alternative method of procedure – in which, after passing a double ligature posteriorly to the site of division, the redundant meatus is severed in advance of this site.

sidered necessary to approximate the margins of the smaller circle of the urethral wound to those of the larger circle of the vaginal wound (Fig. 5269) – after which all are tied.

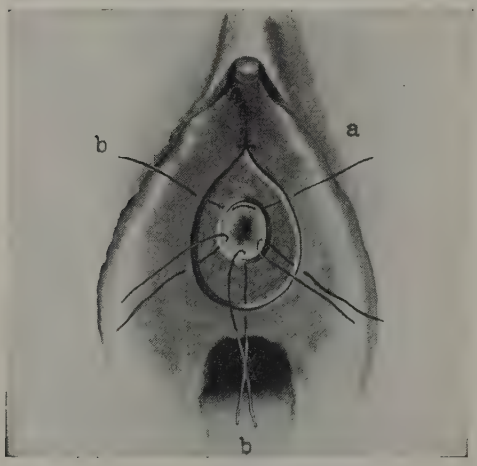


Fig. 5269.—The Same _ III: _ a, b, b, Sutures uniting the cut margins of the urethral and vaginal mucosa.

RESTORATION OF A URETHRA THE ANTERIOR PART OF THE FLOOR OF WHICH HAS SLOUGHED

The anterior portion of the floor of the urethra may be destroyed by necrosis following pressure of the urethra against the pubic arch, in childbearing _ or may be destroyed by pathologic ulceration, especially syphilitic.

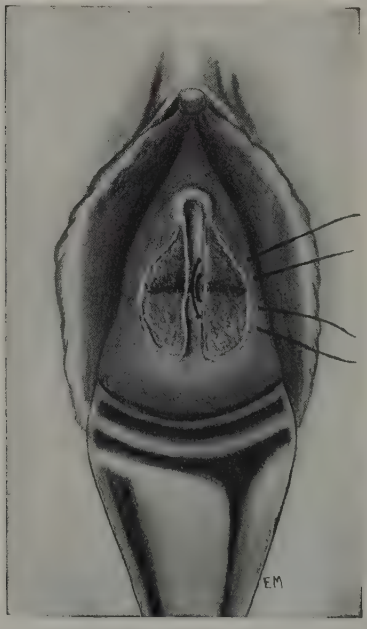


Fig. 5270.—Restoration of a Urethra the Anterior Part of the Floor of Which Has Sloughed _ I; _ The sutures are being tied _ re-establishing the urethral channel.

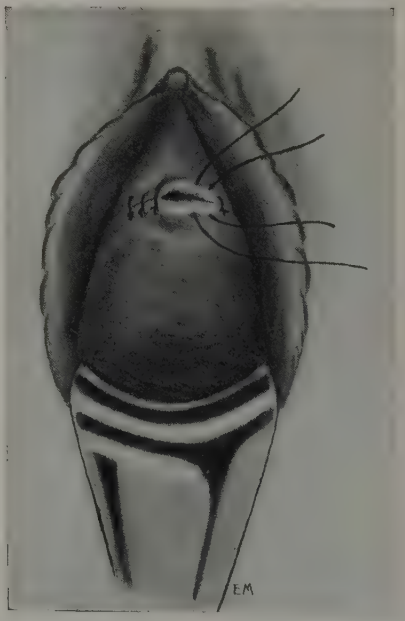


Fig. 5271.—The Same _ II; _ The sutured wound.

In simple cases of this nature it may be possible to resort to the following technic:

After performing a temporary cystostomy for drainage the lateral areas of the anterior vaginal wall, immediately adjacent to the bed of the urethra, now usually represented by a shallow trough, corresponding with what was the roof of the canal, are freshly denuded of their scar tissue. When this has been done sutures are placed in such a manner as to accomplish a twofold result, – that the anterior and posterior aspect of each denuded half, hinging transversely at its center, be brought together on its own side – and that the urethral half trough be doubled upon itself anteroposteriorly, thereby "advancing" the posterior aspect of the trough to the anterior aspect (Fig. 5270). When this forward folding of the posterior upon the anterior portion of the denuded area is accomplished, and the sutures are tied in a transverse row, crossing the anterior part of the vagina, the continuity of the urethra will be re-established by means of the folding upon themselves of the two undenuded half troughs (Fig. 5271).

RESTORATION OF A URETHRA THE ANTERIOR PORTION OF WHICH HAS BEEN DESTROYED – THE REMAINDER OF THE LUMEN COMMUNICATING WITH THE ROOF OF THE VAGINA BY A CONTRACTED ORIFICE

The anterior portion of the urethra may have been destroyed and the lumen of the remaining portion of the canal open in the midst of a mass of irregular and more or less extensive scar tissue by a contracted mouth from which urine may flow without control. The object of the operation is twofold – to construct a more normal orifice – and to secure additional muscular control.

A temporary vaginal cystotostomy for derivative bladder drainage is first established.

Fig. 5272.—Restoration of a Urethra the Anterior Part of the Floor of Which Has Sloughed – I; – The half-trough of urethral roof is seen, with the proximal opening of the urethra and the remnant of the meatus. The laterally adjacent scar tissue has been excised – and interrupted sutures placed, for folding the posterior halves of these surfaces upon the anterior halves. Temporary bladder drainage through the vaginal roof has been established.

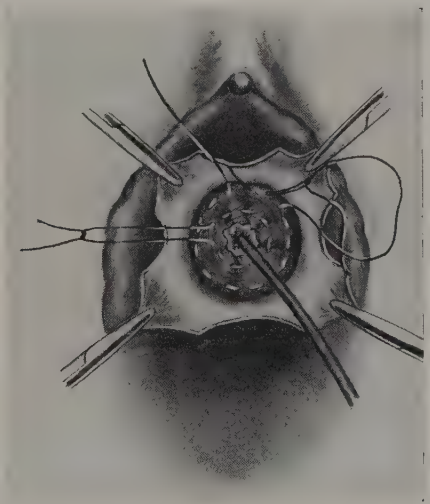


Fig. 5273.—The Same – II; – The circular flap has been raised toward the urethral orifice – the peripheral flaps have been raised outward – and two concentric circles of purse-string suture are seen placed and about to be tied.

The abnormal urethral orifice is surrounded by a circular incision at approximately 1 cm. (6/16 inch) distance from it – and four incisions are made outward from this, equidistantly apart, and extending beyond the scar tissue (Fig. 5272).

The superficial tissues surrounding the urethral orifice and within the encircling incision (mucosa and connective tissue) are dissected and freed inward toward the urethral orifice into which the end of a small-calibered catheter has been introduced.

The four flaps, bounded by the four radiating incisions, are then similarly raised – out beyond the scar tissue, and, in depth, down to the muscle tissue (Fig. 5273).

One or more concentric purse-string sutures of chromic catgut are now placed, surrounding the urethral orifice (upon the Kader principle of gas-

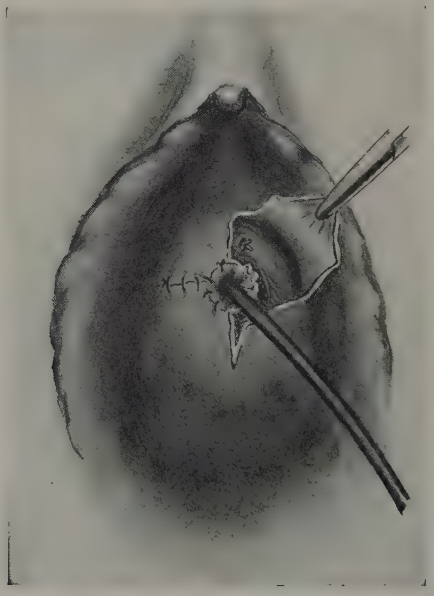


Fig. 5274.—Restoration of a Urethra the Anterior Portion of Whch Has Been Destroyed – the Remainder of the Lumen Communicating With the Roof of the Vagina by a Contracted Orifice; – The lines of incision are shown – the remains of the meatus – and the temporary vaginal cystostomy.

trostomy), each outlying the preceding, and each being tied before the succeeding one is placed (although in the illustration two tiers are shown in position). When these purse-string sutures are tied the tendency is to bulwark up the surrounding muscular tissue against the catheter – constituting thereby a short urethral canal of tissue which is largely muscular, with correspondingly increased control. The four marginal flaps are then brought into position, after which their circular concave periphery is sutured to the circular convex periphery of the mucosal flap of the urinary outlet. The wound in the act of being finally sutured is shown in Fig. 5274. The small catheter within the repaired urethral orifice is usually left in position temporarily.

RESTORATION OF THE PARTIALLY ABSENT URETHRA BY COMBINED INVERTED AND SUPERIMPOSED LATERAL VAGINAL FLAPS

The principle here applied is the same as that employed in the repair of urethrovaginal fistula (v. Index).

The operation is performed in two stages:

First Stage _ Restoration of the Urethra.—The urethra opens upon the median aspect of the anterior vaginal wall at some distance posterior to its usual site. Two lateral rectangular vaginal flaps are raised, one each side of the site that is to form the bed of the new urethra (Fig. 5275). They extend, in length, from the abnormal vaginal opening, outward to a level with the normal position for the meatus. These lateral flaps are so planned

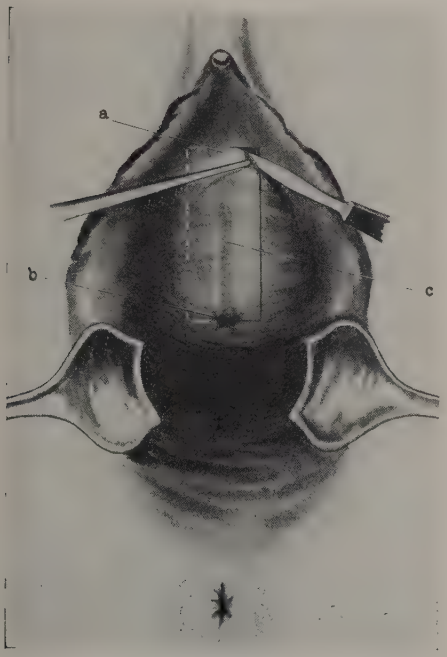


Fig. 5275.—Restoration of the Partially Absent Urethra by Combined Inverted and Superimposed Vaginal Flaps _ I; _ Raising bilateral vaginal flaps between the normal site, **a**, and the present site of the meatus, **b**; _ **c**, usual site of the urethra.

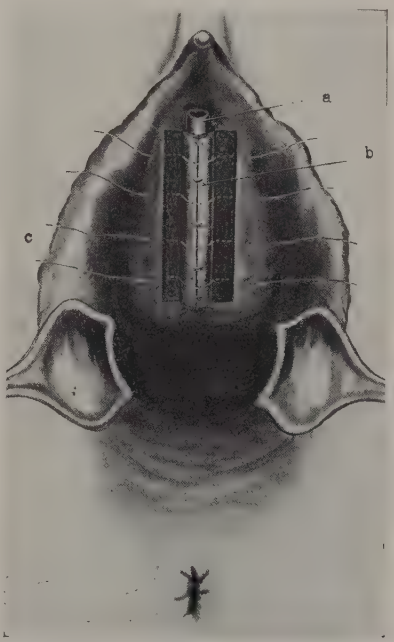


Fig. 5276.—The Same _ II; _ The bilateral flaps are inverted and sutured together at **b** over a catheter which enters the bladder. The beds of the mobilized vaginal flaps are then sutured together, **c**, **c**, in the median line, over the tube and inverted flaps.

as to furnish, when mobilized, a free lateral flap on each side of about 1.5 cm. (9/16 inch). They are raised by seizing their incised margins with forceps and dissecting them up in the connective-tissue bed by knife from without inward _ carefully leaving sufficient attachement toward the median aspect. The posterior transverse cuts should be made on a level with the abnormal urinary opening, but should not pass further mediad than up to the opening without in any way freeing it. These lateral flaps, to be inverted, are then freed from without inward up to their site of hinging _ when they are inverted, mucosa inward, over a piece of rubber catheter (the inner end of which passes into the bladder), and their inner margins sutured together with fine chromic catgut stitches which do not penetrate into the lumen of the new urethra (5276). The adjacent vaginal wall is then sufficiently mobil-

ized to furnish covering flaps which are brought together in the median line over the inverted flaps – thus approximating raw surfaces to raw surfaces – and are sutured together by their margins in the median line – thereby reinforcing the site of the new urethra by double flaps.

Second Stage – Closure of the Abnormal Vaginal Outlet of the Urethra.—After the new urethral canal has entirely solidified the abnormal vaginal meatus is treated as an ordinary urethrovaginal fistula – and closed by one of the operations employed for this purpose. A simple form of procedure is to vivify the margins of the fistulous opening, and then close the opening by non-penetrating purse-string suture or by interrupted sutures – after which the adjacent vaginal margins may be mobilized and sutured over the closed fistula.

RESTORATION OF THE TOTALLY ABSENT URETHRA BY INVERTED MEDIAN VAGINAL FLAPS

NOBLE'S OPERATION

In the case in connection with which Noble evolved this special technic "the entire urethra," he writes, "had been cut away, leaving a large hole

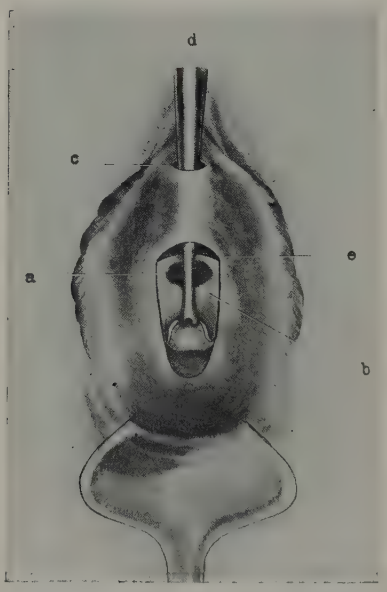


Fig. 5277.—Formation of Entire New Urethra – Noble – I: – **a,** Vesical opening upon the anterior vaginal wall; – **b,** vaginal flap, including vesical opening and extending backward upon the anterior vaginal wall; – **c,** small transverse incision below the clitoris, through which tenaculum forceps, **d,** have tunneled their way under the symphysis pubis, up to a transverse incision, **e,** just anterior to the vesical opening upon the anterior vaginal wall, and beyond, to the free end of the vaginal flap, which they are shown inverting, and drawing through the tunneled channel, to the incision below the clitoris.

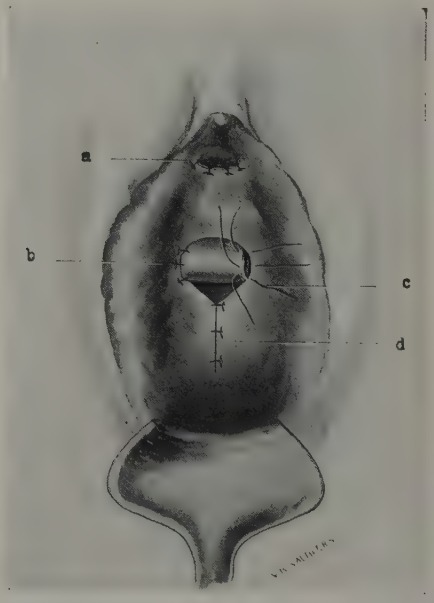


Fig. 5278.—The Same – II: – **a,** New urethral orifice, with free end of flap sutured to lower lip of transverse incision; – **b,** inverted vaginal flap sutured along its margins, to the margins of the incised vagina, knotted on the right, loose on the left, **c**; – **d,** lower portion of vaginal incision sutured vertically. The upper aspect of the tunneled channel is raw – the lower, of mucosa.

corresponding with the neck of the bladder, without any trace of a sphincter muscle."

A urethra 2 cm. (13/16 inch) in length and 2 cm. (1/24 inch) in diameter was constructed in the following manner: — A channel, beginning just above the vaginal vestibule and passing under the pubic symphysis, was tunneled to the vesical opening — from **c** to **e**, in Fig. 5277. A broad tongue-shaped flap was then raised from the median aspect of the anterior vaginal wall — its base corresponding with the lower opening of the tunnel — and its apex lying sufficiently far beyond the abnormal opening to enable it when inverted upon itself to reach without tension to the upper opening of the tunnel (v. Fig. 5278, **b**). A pair of toothed forceps was then carried from the upper to and out of the lower opening of the tunnel — and seized the apex of the mobilized tongue-shaped flap, and, inverting it upon itself, drew it outward through the tunneled tract — until its convex tip projected through the upper opening of the tunnel — where its margin was sutured to the lower one of the two margins of this opening. The lateral margins of the base of the flap were then sutured to the margins of the lower tunnel opening. Finally, the vaginal bed, from which the tongue-shaped flap was raised, is sutured together as far as possible — the remainder being left to granulate.

In the case of the extensive loss, in question, as there was no controling contractile power in the new urethra (and the vesical sphincter had also been lost), the patient had no urinary control — until a special vaginal pessary was devised with a central cushion which exercised sufficient pressure upon the urethra to give complete urinary control.

OPERATIONS FOR INCONTINENCE OF URINE IN THE FEMALE

Urinary incontinence in the female often presents a problem of considerable complexity, the difficulties of combatting it depending chiefly upon its cause and degree in the individual case.

The causes, which may act singly, or in some degree of combination, may be one or more of the following: — traumatism during labor, especially if repeated at subsequent labors, with more or less destruction of tissue, including muscle fibers; — lack of tonicity of the sphincter muscle of the bladder (traumatism and lack of sphincteric control constituting the two most frequent and fruitful causes); — dilatation of the urethra by instrument, finger, stone, or penis (gradual dilation, as by a stone, being less apt to be followed by muscular rupture and permanent incontinence than rapid digital or instrumental dilatation); — maldevelopment of the parts; — prolapse of the bladder; — cystitis; — relaxed pelvic floor; — climacteric muscular atrophy of the vesico-urethral mechanism. Incontinence from overdistention of the bladder, generally due to spinal cord lesions, to psychical states, and the enuresis of childhood, are not considered here.

It will, therefore, be understood that one may be confronted with more than a single causative factor in the production of incontinence in the case in question — and that to be entirely successful, the operative measure or measures must not only include, as far as this may be possible, the gross result of the lesion — which is the urinary leakage — but, and especially, the cause or causes which lead up to it — and of which it is only the final expression. Operation for accompanying vesical prolapse, pelvic floor relation, the repair of special traumatism, and the like may have to be variously combined at different stages.

True urinary incontinence occurs in one of two forms, — either the urine flows out of the bladder as fast as it enters it, through lack of sphincteric control

_ or the urine accumulates, but is passed without voluntary control. In false urinary incontinence the urine of an overdistended bladder simply dribbles away.

Some of the operations most frequently performed for the control of this condition will be described. Usually the aim of each operation is for some one specific purpose.

Operation for Urinary Incontinence by Shortening the Sphincter Vesicæ (Kelly).—The patient is placed in the dorsal gynecologic position _ after a Pezzer catheter has been passed into the bladder and then drawn outward until the bulb of the catheter presses against the neck of the bladder, thus indicating the position of the sphincter of the bladder (as the bulb can be felt through the vaginal wall). With the posterior vaginal wall well retracted a median incision is made down the anterior vaginal wall from 3.7 to 5 cm. ($1\frac{1}{2}$–2 inches) in length, with its center over the neck of the bladder (as deter-

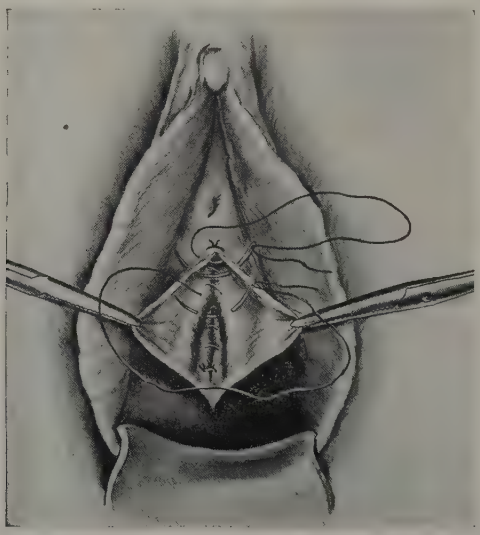


Fig. 5279.—Operation for Incontinence of Urine by Shortening the Sphincter Vesicæ _ Kelly; _ The neck of the bladder has been exposed through a median incision of the anterior vaginal wall _ and the torn and relaxed structures, including the sphincter vesicæ, are being brought together by one or more buried sutures.

mined by the bulb of the Pezzer catheter). The two vaginal flaps are now dissected and retracted outward _ being careful to wound neither the urethra nor the vesical neck during the manipulations. The lateral retraction of the flaps should expose a field of from 2 to 2.5 cm. (9/16–1 inch) about the neck of the bladder. The dissection is accomplished by a blunt dissector and Mayo scissors. The vagina is detached from the bladder sufficiently to enable the finger and thumb to seize from one-third to one-half of the vesical neck, including the adjacent urethra. The torn and relaxed structures at the neck of the bladder are now brought together by two or three sutures of fine silk or linen, preferably mattress sutures, reinforcing each other by superposition (Fig. 5279) _ the principle being the same as that adopted in repairing a ruptured sphincter ani in extensive perineal laceration. This method of tier superposition of the mattress-stitches considerably reinforces the parts about the bladder neck. The sphincter vesicæ lies just in advance of the bulb

of the Pezzer, which is palpable. The Pezzer catheter is withdrawn at this stage. In concluding the operation the margins of the vaginal flaps (especially if there have been redundancy of the vaginal walls) is excised, and the remaining margins brought together by buried and superficial fine catgut sutures — so as to further support the vesical neck and urethra. Postoperative catheterization is avoided unless absolutely needed. The patient is placed in a Gatch bed, in a half-way-up position, from the close of the operation — and is out of bed within a few days.

Operation for Urinary Incontinence by Shortening the Sphincter Vesicæ by Simple Infolding by the Kelly Technic and Reinforcement by the Baldy Tension Suture.—The neck of the bladder is exposed by a median incision through the anterior vaginal wall, followed by a retraction of the dissected walls of the vagina, exposing the same structures in the

Fig. 5280.—Operation for Urinary Incontinence by Shortening the Sphincter Vesicæ by Infolding — Kelly's technic — Reinforced by the Baldy Tension Suture — I; — The region of the vesical neck has been exposed and the relaxed or torn structures, including the sphincter of the bladder, are being infolded by two buried chromic catgut sutures of the mattress order. The position of the bladder neck and urethra are determined by traction upon the Pezzer catheter, shown in outline. The vaginal wound will be closed in the usual manner.

same manner as in the preceding operation — and then, instead of applying mattress-sutures, the structures of the neck of the bladder are brought together by two superimposed tiers of simple, interrupted sutures of chromic catgut — thereby simultaneously narrowing the canal by infolding, and strengthening the relaxed sphincter by shortening it (Fig. 5280). The excess of vaginal flaps is removed and the remaining margins brought together by suture over the reinforced site. Any repair of the pelvic floor that may be indicated is carried out. Finally, Baldy's special type of suture, which at the same time supports the parts and relieves them of tension, is carried through the vaginal walls and tied — in the manner shown in Fig. 5281.

Operation for Urinary Incontinence by Longitudinal Excision of a Wedge-shaped Piece From the Vaginal and Urethral Walls (Frank).—A small catheter is passed through the urethra — after which a section of tissue is excised which includes the vaginal wall and the floor of the urethra —

the cross-section of which is in the form of a wedge, with its base at the vagina – its surface projection being elliptic – and the extent of which is from the

Fig. 5281.—The Same – II; – The sutured wound – reinforced by the Baldy relaxation stitch.

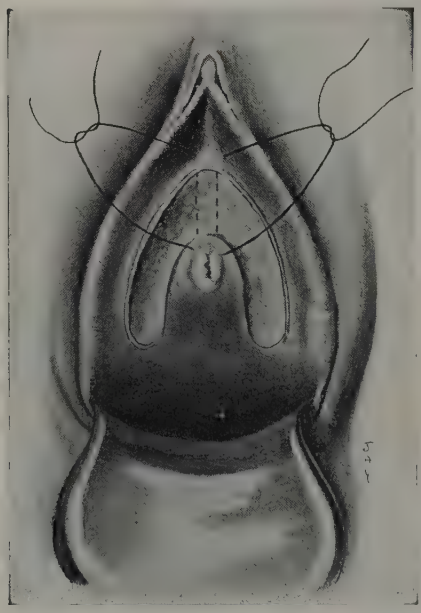


Fig. 5282.—Operation for Urinary Incontinence by Advancement of the Urethra – Pawlik-Dudley – I; – The saddle-bag area of vestibular and vaginal denudation – with the two sutures in position which will draw the meatus forward, thus flattening out the urethra.

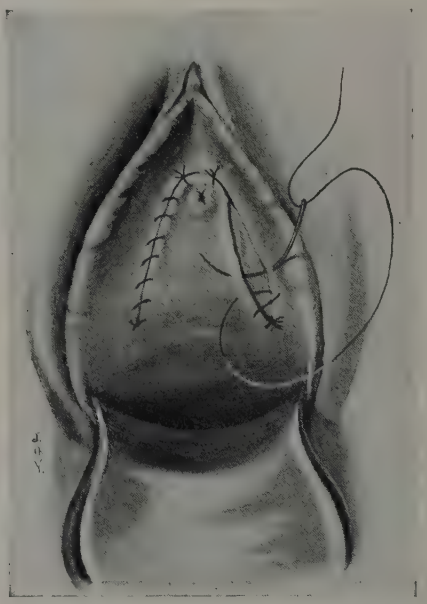


Fig. 5283.—The Same – II; – The closure of the two lateral areas, thereby reinforcing the site, as well as increasing tension against the urethra, which is now interposed between these cicatricial lines and the subpubic arch.

external urethral orifice to within about 1 cm. (9/16 inch) of the vesical orifice of the urethra. The margins of the wound in the urethra are brought

together by interrupted transverse sutures of fine chromic catgut which do not penetrate the urethral lumen _ and the margins of the vaginal wounds by transverse sutures _ a few buried catgut sutures being employed where indicated. It will be noticed that this technic is practically the same as that already described (v. p. 104) and pictured (v. Fig. 5260) for urethrocele.

Operation for Urinary Incontinence by Advancement of the Urethra (Pawlik-Dudley).—The principles here employed are elongation, flattening,

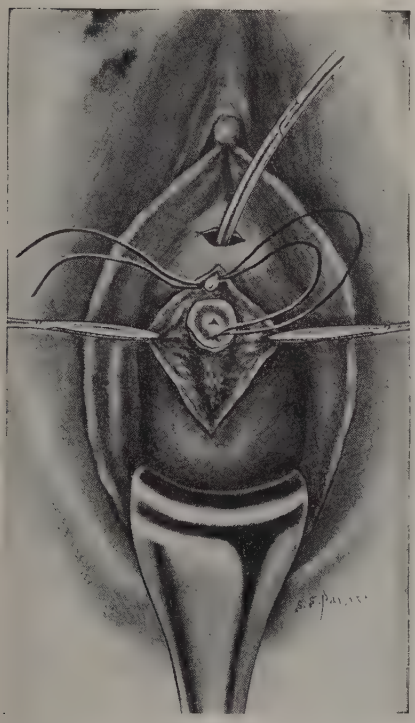


Fig. 5284.—Operation for Urinary Incontinence by Combined Torsion, Advancement, and Tunneling _ Gersuny-Pawlik-Ries _ I; _ The urethra has been partially freed _ a tractor suture placed in the lower aspect of its meatal orifice _ and closed forceps are tunneling their way from a transverse incision a short distance below the clitoris, down to the mobilized urethra, the traction suture of which it has seized, ready to draw it through the tunneled way.

Fig. 5285.—The Same _ II; _ The mobilized urethra has been twisted and drawn through the tunnel and anchored in the transverse incision _ and the redundant portions of the vaginal flaps are excised and their margins sutured together.

compression. A saddle-bag, or horseshoe area, composed of the vestibule and anterior vaginal wall, is denuded _ the central portion of the denudation extending from just behind the clitoris, to just in front of the meatus (Fig. 5282). Two parallel, axial sutures are then placed, as shown in the above illustration _ their function being to draw forward, or "advance" the meatus, and, at the same time, when tied, to anchor it in its new position (Fig. 5283). The tendency of drawing an elastic tube forward is to flatten it. At the same time it brings the urethra under and around the resistant tissues of

the subpubic arch. The effect of this flattening, which is equivalent to narrowing the urethra, is increased by the lateral suturings of the saddle-bag wound — the tendency of which is to produce added tension against, and compression of, the now flattened urethra — all of which are further augmented by scar formation. In concluding the operation, any coexisting causative factor, such as relaxed pelvic floor, should be corrected.

Operation for Urinary Incontinence, by Combined Torsion, Advancement, and Tunneling (Gersuny-Pawlik-Ries).—This procedure represents three technics combined — the torsion of Gersuny — the advancement of Pawlik — and the tunneling of Ries — to which may be added the narrowing of the vaginal floor, common to many of these operations. The urethra is thereby twisted, advanced, carried through a tunnel, bulwarked, and compressed, by lateral tension against the resistant tissues of the subpubic arch. The meatus is surrounded by a circular incision, from the lower aspect of which a median incision is carried down the anterior vaginal wall to a point opposite the neck of the bladder (Fig. 5284). The vaginal flaps are freed back on each side, and the urethra mobilized, but with care to preserve its blood-supply, upon which its integrity is more than usually dependent, owing to the unusual environmental changes to which it is about to be subjected. A temporary tractor suture is placed in the margin of the meatal aspect of the isolated urethra. A transverse incision is then made just below the clitoris, between which and the site of the mobilized urethra a path is tunneled in the connective tissue — through which closed forceps are carried. The temporary tractor is then seized, and the freed urethra drawn through the tunnel. In the act of drawing the urethra through the tunnel, by means of a tractor suture placed through its lower lip, the urethra will be twisted through a half-circle (180 degrees) — and if a greater degree of torsion be desired, this may be brought about by the necessary additional twisting of the urethra (Gersuny applied torsion ranging from 180 to 450 degrees, that is, from a half-circle to a circle-and-a-quarter of twisting.) The meatal end of the urethra is then anchored, by several interrupted sutures, to the margins of the transverse incision below the clitoris — so applying the straight margins of this cut that they will adapt themselves around the circumference of the urethral orifice (Fig. 5285). To secure further support of, and pressure upon, the urethra the redundant margins of the vaginal flaps are excised, so that when the borders of the thereby lessened flaps are sutured together they will more snugly hug the underlying structures.

URETHROVAGINAL FISTULÆ

As there is a considerable variety of urinary fistulæ of the female vesicourethral tract which involve the uterovaginal tract — and as the majority of these are operated upon through the vaginal route — the description of operations for urethrovaginal fistulæ will be found under the Operations Upon the Vagina (see Index).

OPERATIONS FOR EPISPADIAS

In epispadias the upper wall of the urethra is more or less deficient — the clitoris is usually divided — and the labia separated. In more marked cases there is diastasis of the pubic bones, and more or less deficiency of the anterior vesical wall (exstrophy of the bladder).

In other than marked degrees of epispadias, if the patient have urinary control, operation may not be absolutely demanded.

In minor grades of involvement the general principle of operation is to bring together, by suture, broad lateral areas of denuded tissue, over a catheter.

In extreme types of the condition complicated operations have been elaborated in special cases.

OPERATIONS FOR FEMALE HYPOSPADIAS

In hypospadias some part, or all, of the inferior wall of the urethra is missing – and the portion of the urethra which is present empties upon the anterior vaginal wall posterior to the hymen – due to arrested development of the vesicovaginal septum. The external urethral opening may empty upon any portion of the vaginal wall, from its normal site, back to the bladder – even the neck of the bladder sometimes emptying into the vagina.

In minor grades of the condition, with vesical control, the patient may remain comfortable without any form of operation – the urine simply passing into the vagina at some point within the vestibule rather than outside of or upon the vestibule – and being thence voided *via* the vagina.

In more marked grades the general method of procedure is to construct a urethra, over a catheter, – by raising two lateral vaginal flaps and uniting them, by fine chromic catgut suture, over the catheter – to replace the normal urethra. In order to secure additional urinary control in those cases where it is involved, the tissues at the cervical neck are freed and brought together by suture.

TOTAL URETHRECTOMY

The removal of the entire urethra is most frequently called for in malignancy of the structure.

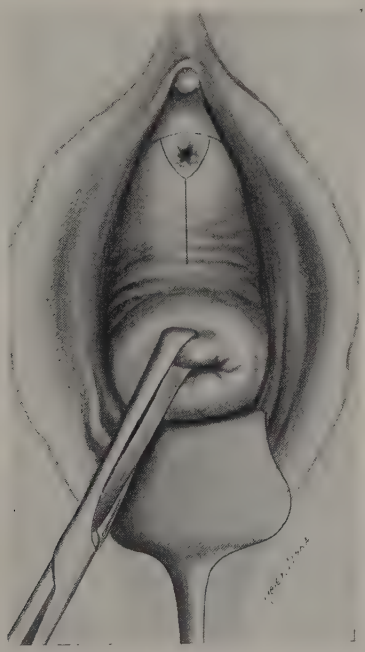


Fig. 5286.—Excision of the Female Urethra – I; – Incisions.

Having retracted the vaginal lips, and drawn the uterus well downward by clamping the os, a curved, transverse vestibular incision is made just in advance of the meatus, with forward convexity, extending about 1 cm. (6/16

inch) to either side of the middle line. Beneath this, and connected with it, the rest of the meatus is surrounded by a three-quarter circular incision — from the middle of the lower aspect of which a median incision is carried down the anterior vaginal wall, to within about 1.5 cm. (10/16 inch) of the neck of the uterus. These incisions are shown in Fig. 5286.

The first step of the operation consists in freeing the urinary meatus — which is accomplished by deepening the above incisions, with retraction of the flaps formed thereby, until the meatus and the beginning of the urethra is isolated and can be seized with a clamp. With this, then, as a handle (Fig. 5287) the urethra is drawn out of its bed — and *pari passu* with the traction upon it, its attachments are divided by means of blunt dissector and curved

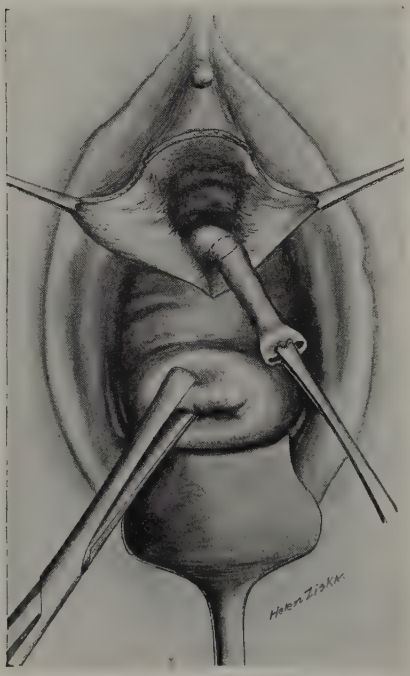


Fig. 5287.—The Same — II; — Turning outward of the vaginal flaps and dissecting the meatus and urethra. The urethra is to be excised at the dotted line.

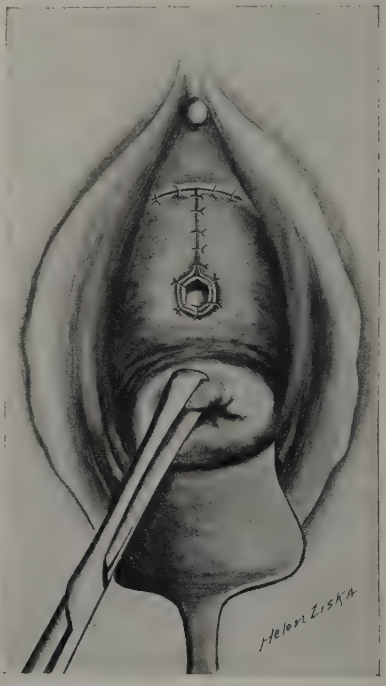


Fig. 5288.—The Same — III; — Anchorage of the urethral stump in the new site — and suturing of the flaps.

Mayo scissors — first freeing its vestibular portion — and then following up the canal under the pubic arch, which is exposed in the dissection — and thence on upward and backward to the neck of the bladder. Prior to dividing the urethra at the cervical neck two controlling traction sutures are placed through the opposite lateral walls of the neck of the bladder, at the vesico-urethral junction, proximal to the site of division, and not penetrating the lumen of the urethra. The urethra is then divided at the neck of the bladder, just in advance of the traction suture — preferably in a slightly beveled fashion, at the expense of the inferior wall of the urethra. The sectioned urethra is then anchored in the lower angle of the vaginal wound, through the margins of the walls of which the ends of the lateral traction sutures are drawn by Reverdin needle — additional sutures being added, if necessary, thus approximating

vesico-urethral to vaginal mucosa. The rest of the vaginal wound is then closed by sutures in T-shaped fashion (Fig. 5288).

All visibly bleeding vessels encountered are ligated and if the subpubic venous plexus be wounded, mass ligature, clamping, or temporary packing may be necessary.

It is rather the rule than the exception for patients thus operated upon to retain urinary control.

Comment.—In malignancy of the urethra, where dissemination into and infiltration of surrounding structures have occurred, simple removal of the urethra is, of course, useless. Bladder drainage may be all that can be instituted. When the urethra is removed for malignancy the inguinal lymphatics should also be excised.

CHAPTER LXXXV

OPERATIONS UPON THE FEMALE EXTERNAL GENERATIVE ORGANS

THE MONS VENERIS _ LABIA MAJORA _ LABIA MINORA _ VAGINAL VESTIBULE _ HYMEN _ CLITORIS _ VAGINAL BULB _ GLANDS OF BARTHOLIN

Surgical anatomy of the female external generative organs, p. 122.

Preparations of patients for vulval, perineal, and vaginal operations, p. 124.

Freeing preputial adhesions in a child, p. 130; _ Operation for agglutination of the labia minor in children, p. 131; _ Operation for redundant prepuce of the clitoris, p. 131; _ Excision of the free portion of the hypertrophied, or diseased clitoris, p. 132; _

Operation for hematomata of the labia majora, p. 134; _ Operation for varicose veins of the labia majora, p. 136; _ Incision or excision of the Bartholinian glands, p. 136.

Operation for hydrocele of the canal of Nuck, p. 137.

Operation for imperforate or imperfectly perforated hymen, p. 138.

Partial excision of the labia minora for hypertrophy, p. 138; _ Excision of small tumors from the labia of the vagina, p. 140; _ Excision of large benign tumors of the labia, p. 141; _ More or less partial excision of the vulva for elephantiasis, and for benign growths of the clitoris, labia minora, and labia majora, p. 142.

More or less total excision of the vulva and of the inguinal lymphatic tracts for malignancy of the vulval structures, p. 145.

SURGICAL ANATOMY OF THE FEMALE EXTERNAL GENERATIVE ORGANS

The Mons Veneris.—The prominent anterosuperior union of the labia majora, constituting the anterior commissure of the labia _ composed of fatty areolar tissue, and covered by dense skin and thickly growing, crisp hair, overlying the symphysis pubis, and surmounting the genital cleft.

The Labia Majora.—Two prominent, axial, rounded folds of skin and connective tissue, bounding the urogenital cleft, laterally _ merging in front and above in the mons veneris, where their size is greatest _ and diverging below and behind, gradually diminishing in size and width, as they approach the anus _ their inferior extremities being sometimes connected, transversely, by the posterior commissure. Their outer surfaces are of darkened skin, covered with hair, more abundantly above, and studded with sebaceous glands _ their inner aspects covered with mucous membrane, continuous with the genito-urinary tracts. The labia majora correspond with the male scrotum. The round ligaments of the uterus terminate in the substance of these labia.

The Labia Minora.—The labia minora, or nymphæ, are two smaller axial folds, covered, without, by modified skin, and, within, by mucosa lying between the vestibule, which they bound, and the labia majora _ usually being hidden by the latter, but sometimes projecting markedly beyond them (occasionally as apron-like folds). They are more prominent above, and diminish below, where they unite with the labia majora _ their lower ends being usually connected, in the young, by a transverse fold crossing the urogenital cleft and forming the posterior boundary of the vestibule, and called the fourchet. Anteriorly, each labium minus divides into an outer, or superior and inner, or inferior fold _ the two outer folds of the labia uniting above the glans of the clitoris to form its prepuce (præputium clitoridis) _ and the two inner folds unite, and are attached, to the inferior aspect of the

glans clitoridis, to form the frenulum clitoridis. The inner aspects of the labia minora are in contact with each other, and their outer aspects, with the labia majora.

The Vestibule of the Vagina.—This is the cleft lying between the labia minora, laterally, the clitoris, in front, and the fourchet, posteriorly. Its surface presents the following structures: – the urethral orifice, in the middle line, above, – the vaginal fissure, in the lower aspect of its middle, – the fossa navicularis, in the lowest median aspect, between the vaginal opening and the

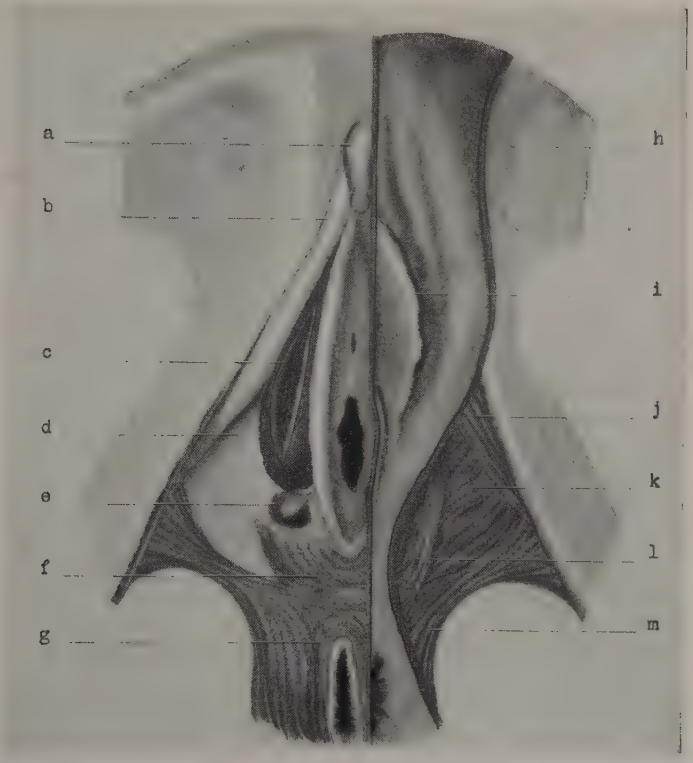


Fig. 5289.—Anatomic Relations of Some of the Deeper Structures of the Vaginal Vestibule and Perineum; – the skin and more superficial parts shown on the left – and the deeper on the right: – **a**, Glans clitoridis; – **b**, crus clitoridis; – **c**, bulbus vestibuli; – **d**, inferior fascia of the urogenital trigone; – **e**, vestibulary gland of Bartholin, with its excretory duct opening upon the vaginal wall, in the recess between the nympha and the hymen; – **f**, sphincter vaginæ (m. bulbocavernosus); – **g**, external sphincter ani; – **h**, symphysis pubis; – **i**, labium minus; – **j**, erector clitoridis (m. ischiocavernosus); – **k**, levator ani; – **l**, sphincter vaginæ; – **m**, transversus perinæi. (Modified from Sobotta and McMurrich and from Hugier.)

fourchet, – the opening of the glands of Bartholin (the vestibular glands), between the bases of the labia minora and the lateral margins of the vaginal orifice, – and the hymen.

The urethral meatus has been described (v. p. 92). The vaginal fissure will be described under Vagina (v. p. 154). The glands of Bartholin and the hymen are given below.

The Hymen.—This structure is a thin, membranous fold, of varying form and completeness, which more or less blocks the vaginal orifice in early life. Its most frequent form is that of a crescentic fold, with its free concave

border directed upward. It may present an irregular opening, several openings, or be imperforate. Its nodular remnants, after rupture, constitute the carunculæ myrtiformes.

The Clitoris.—The clitoris (corresponding with the corpus spongiosum in the male) – the seat of voluptuous sense in the female – is composed of a glans clitoridis, a body, two crura – and its head is partially covered by a prepuce – but, unlike the penis, which it largely resembles, as a morphologic homologue, it has no canal. It is placed beneath the anterior commissure, or mons veneris, surrounded by the folds of the labia minora, and forms the uppermost boundary of the vestibule, lying about 2.5 cm. (1 inch) in front of the urinary meatus.

The body of the clitoris is chiefly made up of erectile tissue, is about 2.5 to 3.1 cm. (1–1¼ inches) in length, and is bent downward upon itself. It is surrounded by a stout fibrous covering, and is incompletely divided by a fibrous septum corporum cavernosum into two somewhat cylindric corpora cavernosa clitoridis. A suspensory ligament connects the fibrous covering of the body of the organ to the symphysis pubis.

The crura of the clitoris are the downward continuations of the corpora cavernosa – each crus being covered by its own ischiocavernosus muscle (erector clitoridis) and is attached to the pubic arch and to the ischial ramus.

The glans clitoridis is formed of a collection of erectile tissue, covered by very sensitive epithelium, and fitting over the ends of the corpora cavernosa clitoridis – and is provided with a prepuce and frenulum by the labia minora.

The glans receives its blood-supply from the dorsal artery of the clitoris (of the internal pudic) – and the crura, from the deep artery of the clitoris (of the internal pudic).

The nerve supply comes from the dorsal nerve of the clitoris, the internal pudic, and the hypogastric sympathetic plexus.

The Vaginal Bulbs.—The bulbus vestibuli of each side (corresponding with the bulbous portion of the corpus spongiosum in the male, though separated and forming one-half of a saddle bag in contour in the female, rather than fused to its mate, as in the male) is made up of a mass of convoluted and plexiform vessels, bound together by a small amount of areolar tissue, giving the tissue an erectile function. The two vaginal bulbs communicating above through the pars intermedia, are situated just to the outer sides of the vaginal and urethral outlets. The bulbs are covered by the bulbocavernosus muscles – and rest upon the lateral walls of the vagina and upon the more superficial aspect of the triangular ligament. They are thicker below, and thinner above, where they are continuous with the erectile tissue of the clitoris. They are supplied by the artery of the bulb (of the internal pudic).

The Glands of Bartholin.—The vestibular glands of Bartholin (corresponding, in the female, with the bulbo-urethral glands of Cowper, in the male) are situated on each side of the posterior aspect of the beginning of the vagina. The vulvovaginal glands are partly covered by the vaginal bulbs, just described, and by the bulbocavernosus muscles – and rest partly upon the anterior aspect of the triangular ligament. Each of the two glands opens, by its duct, upon the inner wall of the vaginal entrance, outside of the hymen, in the angle between the hymen and the labium minus.

PREPARATIONS OF PATIENTS FOR VULVAL, PERINEAL, AND VAGINAL OPERATIONS

General Preparation.—The preparation of patients for these more localized, extraperitoneal types of operations may not, in the simplest cases, appear to require elaborate general measures – yet regard should be had for

the constitutional state in which the patient may be found — and, both on general principle, and for the purpose of securing the aid of the best powers for the local repair of the wound, one should not, except in emergency, go into any operative step with a patient in a general condition found after examination to be one which might be bettered by reasonable measures of preparation through general tonic and hygienic measures. In proportion, however, as an operative procedure by way of the vaginal route may involve the peritoneal cavity, such, for instance, as a vaginal hysterectomy, the operation becomes, of course, a major consideration — requiring the fullest preparatory safeguarding of the patient.

Local Preparation.—The bowels should be previously emptied by purgation, and, again by enema, in advance of the operation — that there be no chance of escape of fecal contents, especially under anesthesia, during operation. The bladder should be emptied in advance. Urination deferred for the maximum time after operation, will often have enabled the lips of some otherwise exposed wounds to become so approximated and agglutinated by swelling and exudate as to be able to ward off, rather than invite, infiltration with urine.

It is best to prepare the vagina by antiseptic douches, even though it be uninvolved in the operation, as in the removal of labial growths — and it is especially indicated when the procedure involves the intravaginal structures. Some form of antiseptic douching should be carried on for one or more days in advance of the operation, once to three times daily — according to the nature of the case — using such solutions as bichlorid of mercury, 1 : 2000, or lysol, 2 per cent., followed, or not, by sterile water or normal saline solution.

In the smallest operations upon the external parts only the immediate field of involvement need be shaved. In some intermediate types of operation the shaving of the parts below the mons veneris will suffice. In the majority of operations, however, it will be best to shave the entire vulvovaginal field. Following the shaving, the parts should be thoroughly washed with green soap and hot water, applied with gauze mops. This shaving and scrubbing are done the day before the operation — and it adds to the thoroughness of the preparation if the parts thenceforth, up to the time of the operation, be protected with a compress wrung out in bichlorid of mercury solution, 1 : 2000.

When the patient comes to the table a final scrubbing with green soap and water is carried out — after which the parts are dried with alcohol, and one-half strength of the official 7 per cent. tincture of iodin is applied to the outer parts — and one-third strength within the vagina. Or the final preparation may end with a 1 : 2000 bichlorid or lysol, 2 per cent. solution, scrubbing of the external and intravaginal parts — followed by sterile water or normal saline. When anesthesia is to be employed, the final preparation usually takes place after its administration — or, if analgesia, in advance of the latter.

The disinfection of the vagina should be as thorough as possible, for while the healthy uterus is free of germs, the tract below the external os is the habitat of bacteria — and especially so in conditions of disease.

If there be any likelihood that the abdominal cavity will be exposed, provision for this contingency should have been made in the general and local preparations.

Anesthesia — Analgesia.—The more minor type of vulvovaginal operations may usually be performed under analgesia. The more major type should be subjected to anesthesia — as well as operations upon the perineum, and those involving complete relaxation, both for purposes of operation and for accompanying examination.

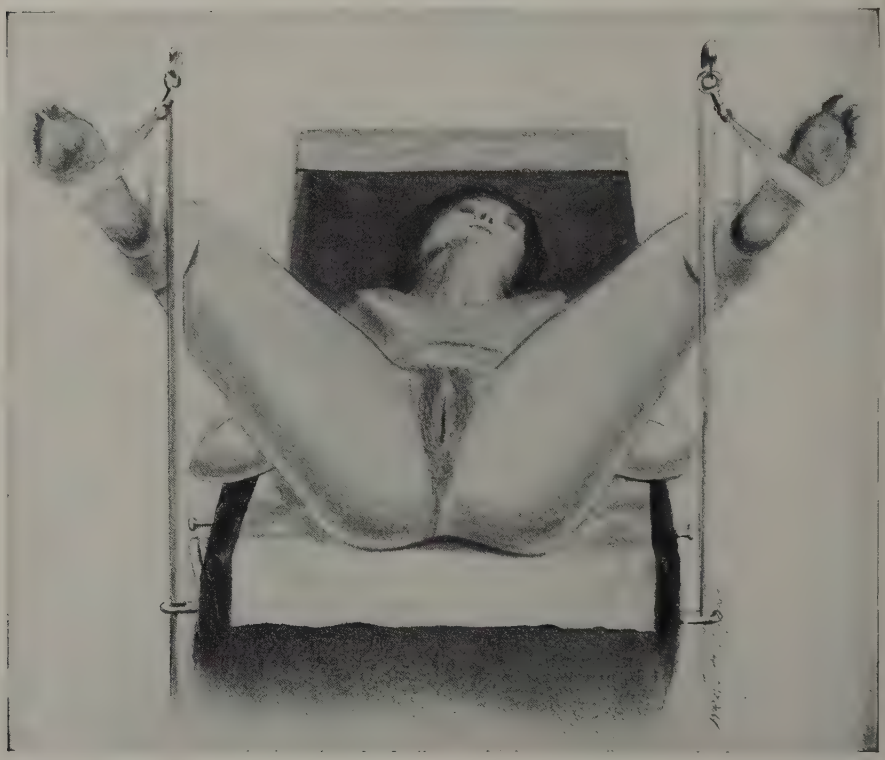


Fig. 5290.—DORSAL GYNECOLOGIC POSITION – with lower limbs supported by stirrups suspended from metallic uprights – seen from the end of the table.

Fig. 5291.—DORSAL GYNECOLOGIC POSITION – with lower limbs supported by stirrups suspended from metallic uprights – seen from the side.

Fig. 5292.—Dorsosacral Gynecologic Position – with lower limbs supported by a Kelly-Robb band – seen from the end of the table.

Fig. 5293.—Dorsosacral Gynecologic Position – with lower limbs supported by a Kelly-Robb band – seen from the side.

Positions of Patients in Vulvo-vagino-perineal Operations.—The position which most conveniently brings the parts into accessibility for the

majority of procedures is the dorsal decubitus, at the end of the table, with the legs and thighs in some degree of flexion and separation from each other – as shown in Figs. 5290–5293. In some operations upon the anterior vaginal wall, such, for instance, as in vesicovaginal fistula, Sims' position, with the

Fig. 5294.—Sims' Left Pectorolateral Position.

posterior vaginal wall retracted, exposes the field well (Fig. 5294). In operating upon the upper part of the vulva, or in stages of operations in which incisions into the inguinal regions are made in continuity with the vulvovaginal wound, the horizontal dorsal posture is required.

Fig. 5295.—Knee-elbow Position.

As an aid in making examination other positions may be assumed – such as the knee-elbow posture (Fig. 5295) – and the knee-chest position (Fig. 5296), especially serviceable in making urethral and vesical examinations.

When the position indicated by the needs of the operation has been

assumed, the parts should be so draped, with aseptic coverings, as to shield the immediate field, which has been prepared, from the adjacent regions – the crossings of the draperies being clamped, to hold them in place (Fig. 5297).

Fig. 5296.—Knee-chest Position.

After-treatment.—In vulvo-vagino-perineal operations the complications which subsequently arise, as to the dressings, which are applied over the parts before the patient leaves the table, are connected with the unavoidable bowel and bladder actions, during which some degree of soiling of the wounds

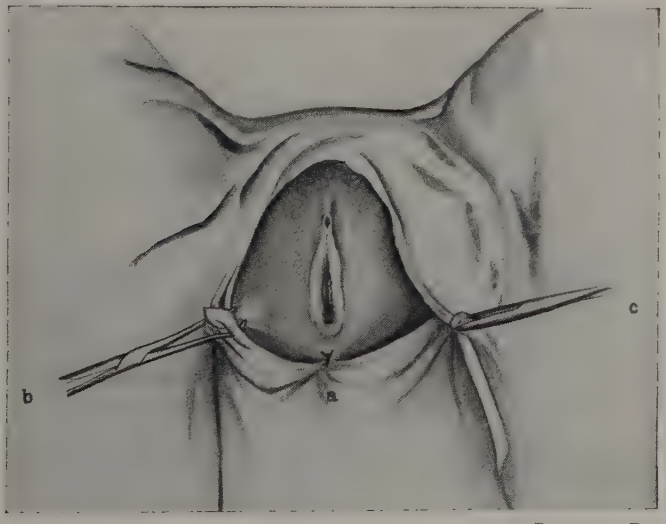


Fig. 5297.—Methods of Holding Protective Draperies to the Perineum During Operation: – a, Suture of drapery to skin; – b, clamping drapery to skin; – c, clamping the crossed edges of drapery to each other.

almost certainly occurs. Following such soilings the parts are at once cleansed and fresh dressings reapplied and held on by a T-bandage. The cleansing may be conveniently accomplished by pitcher douching – by pouring a warm

solution of bichlorid of mercury, 1 : 5000, from a wide-mouthed pitcher, over the exposed parts. Every care must be exercised not to jeopardize surface suturings by putting the parts upon the stretch.

Voluntary urination following operation is to be encouraged _ using if need be a partially propped-up posture, warm applications over the bladder (if not contraindicated), digital pressure over the bladder, the sound of nearby running water, and the like. Immediately following urination the vulvovaginal outlet should be douched with warm saline solution or with some weak antiseptic solution.

If catheterization must be performed, it should be carried out with scrupulous care _ as to the hands which conduct it _ the antiseptic cleansing of the parts immediately adjacent to the meatus _ the careful performance of the technic _ and the rigid avoidance of stretching sutures in the vicinity, in the separation of thighs and labia, in the carrying out of the act.

FREEING PREPUTIAL ADHESIONS IN A CHILD

Adhesions between the head of the clitoris and the preputial folds derived from the labia minora are very frequently encountered. Their chief signifi-

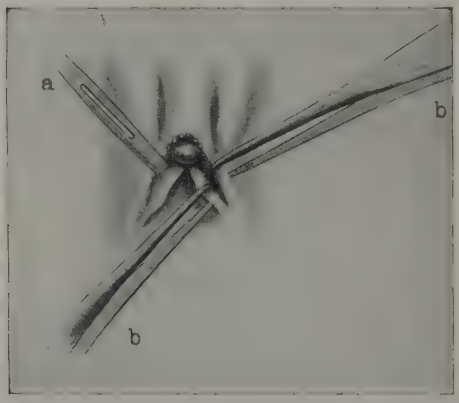


Fig. 5298.—Freeing Preputial Adhesions in a Child: _ a, By means of the flat end of a probe passed in the furrow of the cleavage line; _ b, b, by means of two forceps, which draw apart the adherent flaps or surfaces. Concretions of glandular excretions are shown.

cance is that they are apt to lead to the collection of smega, which, owing to their presence, cannot be freed _ and, in consequence, is apt to cause irritation _ followed by frictioning of the parts by the child's hands _ innocent at first _ but apt to end in masturbation.

It is a parent's duty to see that the glans penis and the glans clitoridis of their children can be sufficiently freed for the purpose of thorough daily cleanliness. Circumcision is often necessary to this end in the male _ and sometimes in the female. The breaking up of adhesions between the glans of the clitoris and the preputial folds will, however, usually suffice in female children.

Freeing the parts can generally be accomplished by taking the preputial folds between the thumb and finger of the left hand, and, while pressing these folds backward toward the pubis, thereby exposing the clitoris more fully, the adherent folds can often be separated with the blunt end of a probe (Fig. 5298, **a**). Where the adhesions are firmer, an Assistant may press the folds of the prepuce backward, while the Surgeon, with a pair of fine

forceps in each hand, draws away from each other the folds which are bound together and bound to the clitoris by adhesions (v. Fig. 5298, **b, b**).

OPERATION FOR AGGLUTINATION OF THE LABIA MINORA IN CHILDREN

The labia minora of young children may become agglutinated through adhesions, following the loss of epithelial covering of these parts by inflammatory processes. In other instances a median raphé is present, along the site of the inner margins of the labia minora, the condition in this category of cases appearing to be congenital.

The technic adopted by Kelly is to carry a median incision through the congenital anomaly, or pathologic adhesion, from the free margin down to the floor of the vagina, or to what would correspond with the normal fourchette (Fig. 5299). The parts then gape in V-shaped fashion _ and, in Kelly's

Fig. 5299.—Labial Agglutination in a Child _ I; _ The dotted line shows the site of vertical incision of the agglutinated labia minora.

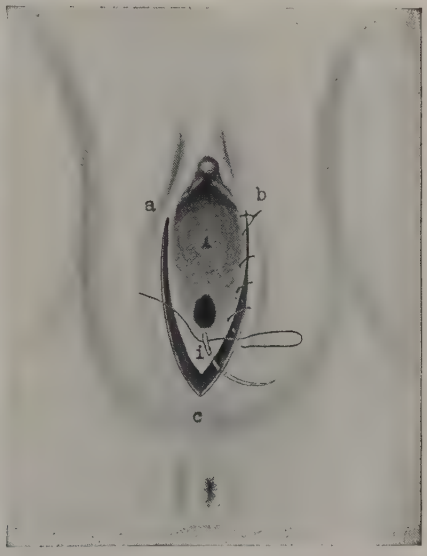


Fig. 5300.—The Same _ II; _ Following the vertical incision the cut margins retract into a V-shaped wound, the edges of which are sutured, thus forming the new lateral boundaries of the vestibule _ **ib** being sutured to **cb**, and **ia** to **ca**. (If **ia** were sutured to **cb** and **ca** to **cb** the original deformity would be reproduced.)

procedure, are, as appears, allowed to heal by granulation. It would seem, however, advisable that the mucous and cutaneous margins of the same side of the vagina should be closed by suture (unless the plane of adhesion be exceedingly thin _ Fig. 5300) _ thus leaving united rather than raw surfaces.

OPERATION FOR REDUNDANT PREPUCE OF THE CLITORIS

The preputial folds are sometimes sufficiently redundant to hang over the clitoris and completely conceal it _ even interfering with the fully sentient contact of the erect clitoris with the pubis of the male in sexual intercourse.

When the preputial folds are very excessive, the best plan is to excise the more redundant portion _ suturing together the margins of the raw edges.

When the redundancy is not very marked, some form of so-called plastic operation may succeed in exposing the glans sufficiently for practical purposes _ as about to be described.

In employing the often used principle of increasing the pull or up-lift of a part by transversely approximating an axial opening _ a median vertical incision is made, beginning over the shaved pubis, and extending as far down over the clitoris, toward, but not to, the free margin of the prepuce as the degree of redundancy may require _ passing through the skin and well into the connective tissue (Fig. 5301). The sutures are then inserted _ paralleling the axis of the wound, as shown in the picture just mentioned. The effect of these stitches when tied, however, will not be to approximate the tissues hitherto in contact (that is, the sides of the wound) _ but to spread out and approximate the upper half to the lower half of the wound margins (Fig. 5302). The prepuce is thus pulled up and above the head of the clitoris.

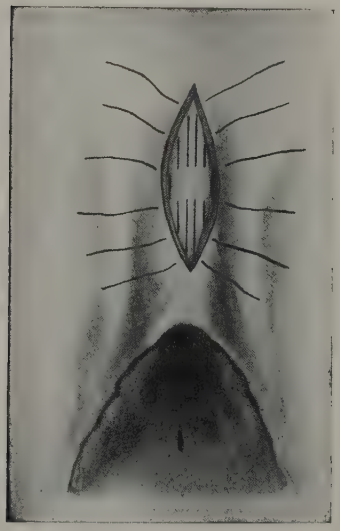


Fig. 5301.—Shortening of Redundant Præputium Clitoridis _ I; _ An elliptic excision of skin is made just above the free edge of the fold covering the clitoris, in the axis of the cleft of the vulva.

Fig. 5302.—The Same _ II; _ The vertical wound is then sutured by axial stitches, so as to approximate it transversely _ thus drawing the preputial fold upward, and thereby exposing the glans clitoridis.

A more marked result is obtained if a small elliptic piece of skin be excised rather than a simple incision be made.

EXCISION OF THE FREE PORTION OF THE HYPERTROPHIED OR DISEASED CLITORIS

The clitoris may be very unusually enlarged through simple hypertrophy _ or through a condition considered by Kelly to be due to lymphatic blockage of the parts (differing from tropical elephantiasis of parasitic origin) _ or may be enlarged as a part of a tumor involvement, benign or malign, of itself alone, or of itself and neighboring structures.

In cases of involvement which also includes the adjacent parts the operative steps will be the more extensive ones described upon pages 142–153. In the unusual cases in which it might be indicated to remove the crura of the clitoris, together with its free portion, the steps are largely the same,

except upon a smaller scale, as those described for the total removal of the penis (v. Vol. V, p. 783).

Fig. 5303.—Partial Excision of the Hypertrophied Clitoris – I; The foreskin of the enlarged clitoris is retracted upon each side, exposing the free portion of the enlarged organ. Two lateral amputation flaps of mucosa are outlined.

In removing the free portion of the enlarged clitoris, the procedure may be carried out as a minor type of amputating by bilateral flaps. Under an-

Fig. 5304.—The Same – II; – The two lateral semi-elliptic mucous flaps are incised and retracted backward – after which the body is divided transversely or, better, in wedge-fashion at the level of the bases of the retracted flaps. The bleeding vessels are ligated and the flaps sutured over the divided crura.

esthesia, or analgesiation, as indicated, the clitoris, grasped through the medium of a piece of gauze (or held by a clamp) is drawn outward (the adjacent parts

being drawn backward by retractors) – while two small lateral flaps, each consisting of one-half the thickness of the clitoris, are planned (Fig. 5303). The mucosa is first incised, and the two small mucosal flaps thus outlined, with forward convexity, are allowed to slightly retract – and then, upon the outline of these retracted flaps, as much of the free portion of the organ is excised as considered necessary – the excision being accomplished in such a manner as to remove a wedge-shaped piece of tissue, with anteroposterior axis, so that the sides of the remaining portion of clitoris, from which it was removed will readily come together. The dorsal vessels of the clitoris and the vessels of the crura (usually considerably enlarged in these cases) are then tied with fine catgut. Finally, the margins of the flaps, including the overlying margins of mucosa, are brought together by transversely placed fine catgut stitches (Fig. 5304).

OPERATION FOR HEMATOMA OF THE LABIA MAJORA

Hemorrhage into the labia majora, ending in a blood-clot within the structures, sometimes occurs as a result of direct outside injury, or in connec-

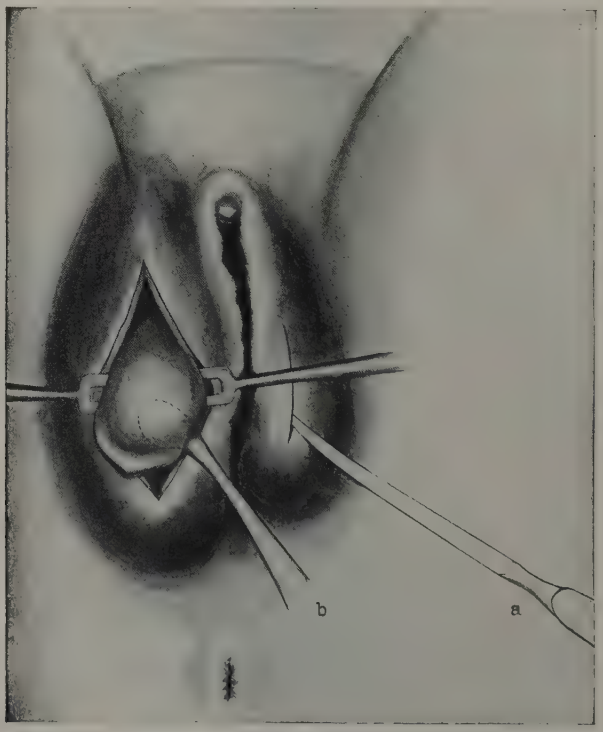


Fig. 5305.—Incision and Enucleation of Hematomata of Labia Majora: – a, Operation by stab incision into the connective tissue and evacuation of fluid blood – followed, if necessary, by the ligation of bleeding vessels; – operation by dissection into the connective-tissue plane and evacuation of the blood-clot with a spoon.

tion with childbearing. The outflow of blood may be minor and become spontaneously absorbed – but, on the other hand, the firmly clotted mass may, unless removed, become infected, terminating in a suppurating process.

The type of hemorrhage here considered constitutes infrafascial hema-

tomata (that is, the lesion is below the pelvic fascia) – in contradistinction from suprafascial hematomata (where the blood infiltration involves the intrapelvic connective-tissue structures extraperitonally).

At the time of operation the blood may be in a fluid state, with the hemorrhage still progressing – or in a firm clot, the bleeding having ceased.

In either case the approach is made through an axial incision over the swollen labium, usually upon its outer aspect. If fluctuant blood be present the part may be laid open by a stab incision, enlarging the opening in the withdrawal of the knife (Fig. 5305, **a**). In the uncertainty of the condition, however – (never forgetting, also, that a hernia may occur into the canal of Nuck and simulate a collection of blood or pus) – exposure by deliberate dissection, from without inward, is better.

If bleeding be still active after freeing the part of the collected blood, the vessel or vessels from which hemorrhage comes are sought and tied with fine catgut. The cavity is then wiped out with gauze and sutured up.

If bleeding have ceased and a hematoma be present, the clotted blood tumor may usually, upon free exposure by dissection and retraction of the wound lips, be spooned out of its bed (v. Fig. 5305, **b**). Even here search should be made for any possible bleeder, which, if detected, should be tied. The wound is, as in the preceding instance, closed by suture.

If any suspicion of infection be present, a small drain should be inserted into the wound – which is then closed up to its exit.

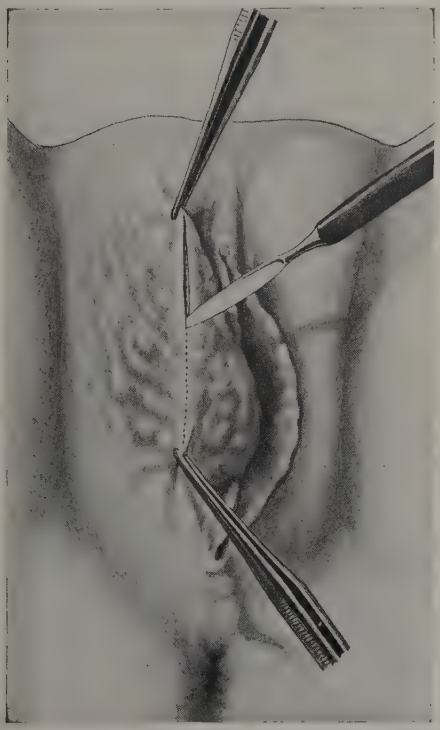


Fig. 5306.—Operation for Varicose Veins of the Labia Majora – I; – The involved labium is tensed between two forceps, both for steadying it and for giving a straight, relatively flat plateau along which to incise the mucocutaneous tissues.

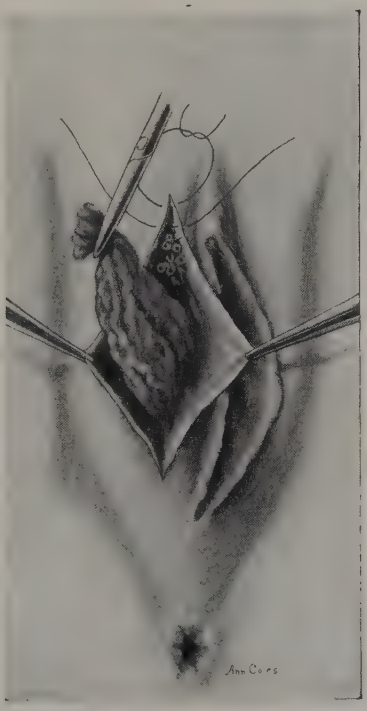


Fig. 5307.—The Same – II; – The mass of veins have been isolated – and, at their upper end, ligated and divided – as will be done at their lower end. The beginning of the wound suturing is shown.

OPERATION FOR VARICOSE VEINS OF THE LABIA MAJORA

Varicosity of the labial veins may be present in a very marked degree _ and especially should this condition, if marked, be met in advance of an impending pregnancy, during which they may offer serious obstruction to delivery, or their rupture, at this time, may prove the source of desperate or even fatal hemorrhage.

They may generally be excised under analgesia. The upper and lower poles of the labium majus are siezed with non-traumatizing clamp forceps, and drawn in opposite directions, thus tensing and elevating into a prominent fold the antero-external aspect of the labium. While thus held the prominent border of the lip is incised, by knife, from forceps to forceps (Fig. 5306) _ the incision passing through skin and fascia, down to the plexus of veins. The entire plexus of the side is carefully isolated, by combined blunt and sharp dissection, from its upper to its lower limit _ carefully avoiding dividing any of the vessels. When both limits of the contorted vessels have been well cleared, a chromic catgut ligature is thrown around the limits of the freed mass _ which is then excised between the ligatures (Fig. 5307).

The deeper parts of the wound are brought together by a few buried catgut stitches _ after which the wound is closed throughout. If any hemorrhagic oozing be feared, it is better to use a small temporary drain than risk having the wound distended by a hematoma.

INCISION OR EXCISION OF THE BARTHOLINIAN GLANDS FOR SUPPURATION OR CYSTIC ENLARGEMENT

Incision of a Suppurating Bartholinian Gland.—Infection of these glands is apt to occur, especially as a result of gonorrheal vaginitis transmitted along the ducts. Under such circumstances it is rarely possible to do other than make an incision through the overlying parts, into the gland, and institute drainage _ although excision of the unopened pus sac, if possible, is preferable.

In operating by incision the vaginal lips are everted and held apart by retractors _ and a vertical or slightly curvilinear axial cut is made at the junction of skin and mucosa, through the integumentary coverings, into the suppurating gland. This may be a stab incision directly into the gland, enlarging the opening during the withdrawal of the knife (Fig. 5308, **a**) _ but it is better to make it by deliberate dissection, from without inward. Bleeding from the veins of the vaginal bulb may be annoying, and may require the use of ligature. The finger, or a blunt dissector, should be carried into the site of suppuration, and any septa which are found, walling off pockets, should be broken down The cavity may be cureted _ or treated with carbolic acid and alcohol. The suppurating bed is then packed with gauze (Fig. 5309, **a**) _ and drainage is maintained until it is certain that healing will occur from the bottom.

Excision of a Suppurating or Cystic Bartholinian Gland.—This procedure is always to be undertaken in the case of a simple, non-infected cyst _ and is the ideal method to be aimed at, though rarely accomplishable, in the case of suppuration of the gland, provided the wall of the gland have not ruptured into the surrounding connective-tissue plane. This is always a deliberate dissection, from without inward, layer by layer _ begun by an axial knife cut made over the gland, which is then freed by combined blunt dissection and sharp dissection with curved Mayo scissors (v. Fig. 5308, **c** and **b**) _ most carefully avoiding rupturing the sac containing pus or other fluid. When the gland has been almost entirely freed, a fine chromic catgut ligature is slipped over it, and passed on down until it can be tied around the duct of the gland _ after which the duct is divided by scissors distal to the

ligature (v. Fig. 5308, **d**). It is better still if the duct can be divided between two ligatures. If much of a pocket be left by excising the unopened gland, its bed may be lessened by one or two buried catgut sutures _ after which the mucocutaneous lips are brought together (v. Fig. 5309, **b**).

The dissection of the gland may be considerably more difficult than might, at first, appear. And hemorrhage from the branches of the internal pudic vessels may require ligation.

Sometimes an obstinate sinus exists, having resulted from some preceding suppuration _ in which cases this must be dissected out along with the rem-

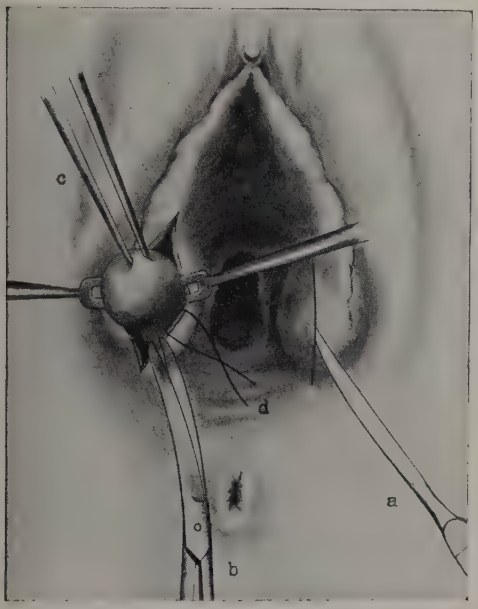


Fig. 5308.—Operations for Abscess of the Bartholinian Glands _ I: _ **a**, Incision of the gland to liberate pus _ the knife passing through the skin and connective tissue into the pus sac; _ **b**, excision of the gland intact, without rupturing its cavity _ a loose ligature shown ready to be slipped to the distal end of the duct of the gland and tied.

Fig. 5309.—The Same _ II: _ **a**, Gauze drainage is shown packed within the incised gland; _ **b**, site of the excised gland is sutured _ the walls of its bed being approximated by buried sutures, and the skin, by ordinary interrupted sutures.

nant of the gland. In these cases temporary drainage is indicated in the already infected site.

OPERATION FOR HYDROCELE OF THE CANAL OF NUCK

In this error of development, which is occasionally encountered, fluid accumulates between the round ligament (whose lower end becomes lost in the substance of the labium majus) and the canal of Nuck (a process of peritoneum which accompanies it). If the peritoneal sac be shut off from the general peritoneal cavity, an encysted hydrocele exists. The condition usually remains latent _ unless made manifest by some intercurrent involvement, when its presence is generally recognized in the upper aspect of the labium majus, extending downward from the external abdominal ring _ being always present in the encysted form _ and only detectable on standing if the labial sac communicate with the general peritoneal cavity.

In operating for the condition an incision is made over the axis of the

tumor, through the structures of the labium majus – the sac is carefully exposed (having always in mind the possibility of hernia). Having fully exposed the structure, if the hydrocele be encysted, the site of constriction in the canal of Nuck may be further reinforced by a chromic catgut ligature – after which the cyst is excised and the wound closed. If, on the other hand, the canal of Nuck still communicates with the peritoneal cavity, it is traced as high up as possible, isolated, tied off, and excised below the ligature. If there be any question as to the nature of the contents of the canal, it should be opened before it is ligated. The wound is then closed by buried and superficial suture.

OPERATION FOR IMPERFORATE OR IMPERFECTLY PERFORATED HYMEN

A hymen which has either no opening at all, or one of insufficient size, may call for operation for the relief of one or the other of two conditions, or both – either because the hymenal structure has served as a barrier to the escape of menstrual fluid from within – or as a barrier against the entrance, from without, of the male organ, in sexual intercourse. The recognition of the need of an opening, or a fuller opening for the menstrual flow, is usually the first discovery. As a barrier against intercourse, it is distinctly exceptional to encounter a hymen which has successfully resisted vigorous attempts to accomplish sexual *introitus vaginæ* – although such resistant types of hymena are sometimes encountered – as well as stout, elastic types of hymena which are temporarily distended, or rolled back by the entering organ without rupturing – to again assume the form of a partial barrier upon withdrawal.

The usual procedure is either to simply cross-cut (crucially incise) the obstructing membrane, which usually suffices in the thinner types of obstructing barrier – or, in the stouter, firmer types, to first crucially incise the membrane, and then excise the resulting quadrants at their junction with the vaginal wall – suturing, if need be, the proximal and distal margins of the circular wound upon the vaginal wall, from which the base of the hymen was cut.

The operative details are the same as in operating for vaginal septum (v. p. 166, under Operations Upon the Vagina) – where the condition is dealt with as an obstructing barrier to menstruation, and as the cause of accumulation of menstrual blood in the vagina (hematocolpos), or an accumulation of blood in both vagina and uterus (hematocolpometra), or even an accumulation within the vagina, uterus, and both fallopian tubes.

PARTIAL EXCISION OF THE LABIA MINORA FOR HYPERTROPHY

The labia minora are sometimes so hypertrophied and elongated as to protrude for some distance beyond the labia majora, and hang downward, apron fashion, between the thighs – a marked degree of this hypertrophy being normal among some of the colored tribes of Africa, the folds reaching far down the thighs.

In the hypertrophied condition encountered among the white races it is not desirable to remove the entire lip or lips – but only the portion which projects beyond the covering and protecting labia majora. To this end the base of the protuberant portion is surrounded by a long, narrow elliptic incision in the axis of the lip (Fig. 5310, **a, b**) – the general technic being the same as though one were excising a solid tumor of the part – as just described (v. p. 141). The two sides of the long, narrow ellipse are carried down, bevel fashion, into the substance of the smaller lip – sufficiently distal to its base to leave a remnant of the lip after the excess is removed. Following the excision of the redundant portion, the margins of the wound are brought together by interrupted sutures of fine chromic catgut (v. Fig. 5310, **c**).

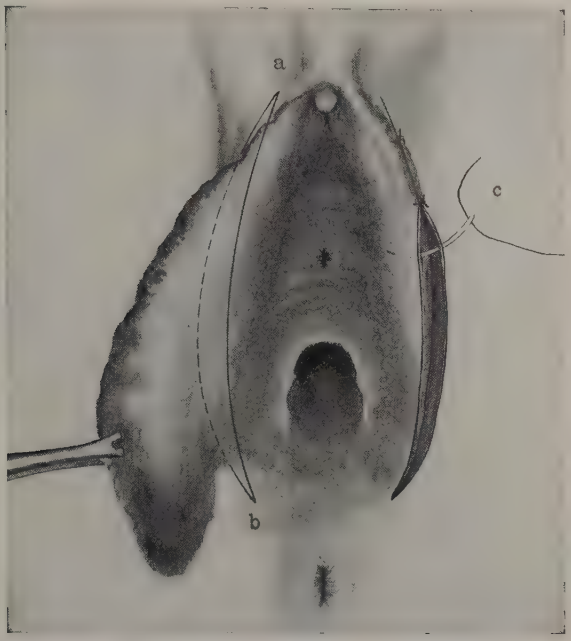


Fig. 5310.—Partial Excision of Labia Minora for Hypertrophy: _ ab, Elliptic incision surrounding base of redundant portion of right labium minus; _ c, bed of partially excised left labium minus in the act of being sutured.

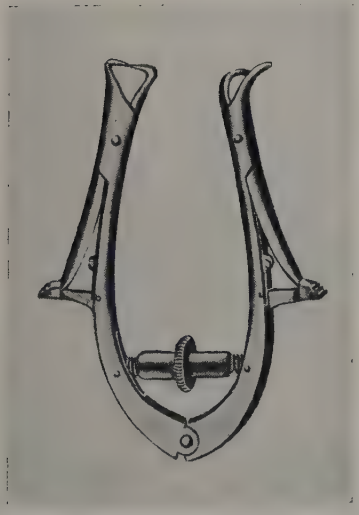


Fig. 5311.—Friedmann's Perineorrhaphy Retractor.

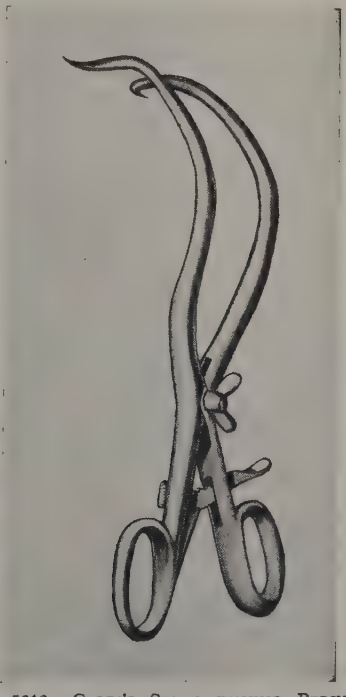


Fig. 5312.—Gelpi's Self-retaining Perineal Retractor.

EXCISION OF SMALL TUMORS FROM THE LABIA OF THE VAGINA

Small cystic and solid tumors are apt to be encountered upon the labia of the vagina. Their removal is usually a simple problem – especially if the growths present themselves upon the outer aspects of the lips. If they be upon the inner aspects, these aspects, including the tumor, must be exposed by retracting the lips laterally – which may be accomplished by the fingers,

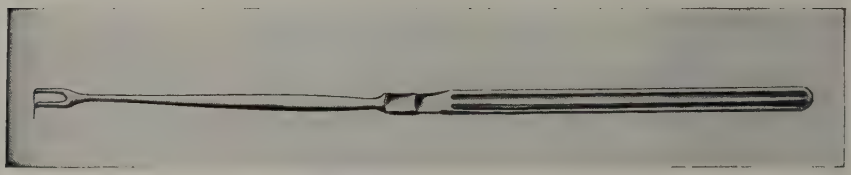


Fig. 5313.—Simon's Double-hook Retractor.

by ordinary vaginal retractors, or by some special form of automatic retractor (as seen in Figs. 5311 and 5312).

The small tumor, thus exposed, is then steadied preliminary to excision. If cystic, it is conveniently held by ribbed or toothed forceps. If solid, it may be similarly held – or be steadied by a double-hook tenaculum (Fig. 5313).

The general principle of procedure is an elliptic incision surrounding the base of the growth – which is then deepened, wedge-shaped fashion, until

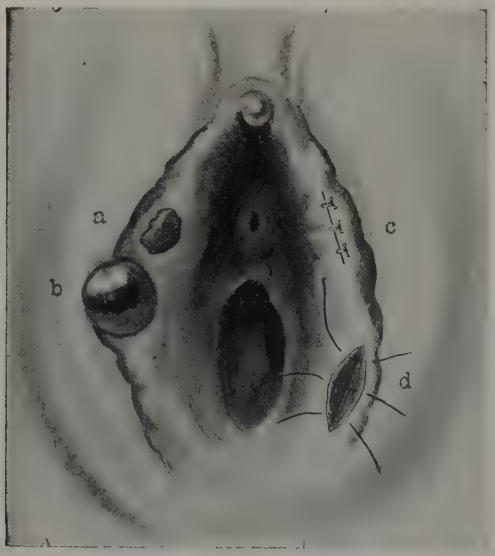


Fig. 5314.—Excision of Small Tumors From the Labia: – a, Papilloma; – b, cyst; – d, such a bed as might be left after the excision of either of these structures; – c, the same, sutured.

the two sides of the incision meet in the connective-tissue plane beneath the tumor. The resulting lips of the wound from which the tumor has been excised are then brought together by a few interrupted, fine catgut sutures. The steps of the technic are shown in Fig. 5314.

EXCISION OF LARGE BENIGN TUMORS OF THE LABIA

The larger benign tumors of the labia are apt to be, if solid, lipomata or fibromata – and, if fluid, simple cysts. The method of excision is the same, in kind, as in removing corresponding smaller tumors of these parts, as just described (v. p. 140) – differing usually only in magnitude.

An elliptic incision is made (Fig. 5315) – the length of which is somewhat less than that of the tumor which is to be removed through its retracted lips – and width of the skin aspect which is to be excised along with the tumor, corresponding with the dimensions of the tumor, little skin being sacrificed in relatively small, narrow tumors, and more skin being included in larger, wider tumors, the axis of the elliptic incision corresponding with axis of the involved labium.

The incision passes through skin and connective tissue into the cleavage plane just outside of the pathologic structure of the tumor – and, within this

Fig. 5315.—Fibroma or Lipoma of the Labium Major – line of elliptic excision.

plane, enucleation of the tumor mass takes place. Several small arteries and veins are due to be encountered, and should be clamped, tied with fine chromic catgut, and divided. It is in this type of case that hemostasis should be definitely secured before suturing, as the parts are, naturally, flaccid, and this fact, together with the excess of covering usually left by removal of the tumor, invite to the filling of the resulting cavity with blood – its coagulation constituting a hematoma, which is apt to undergo infection, and end in suppuration – rather than in primary union. It is well, therefore, to first bring together the deeper parts of the wound by means of a few buried catgut stitches. If the dressing can be made to exercise some direct pressure temporarily, by means of a tight T-bandage, this will aid in the prevention of postoperative bleeding into the sac.

MORE OR LESS PARTIAL EXCISION OF THE VULVA FOR ELEPHANTIASIS AND FOR BENIGN GROWTHS OF THE CLITORIS, LABIA MINORA, AND LABIA MAJORA

In the more or less extensive though irregularly distributed partial involvements of the structures composing the vulva, it may be possible to so plan the lines of section, through which the diseased parts are removed, as to leave wound margins which can be brought into very fair approximation – rather than leave large surfaces to be closed by plastic procedures or be left to granulate.

In the accompanying type of involvement of the clitoris and parts of the labia of both sides, an incision of somewhat saddle-bag type (Fig. 5316) is

Fig. 5316.—Partial Excision of the Vulva for Elephantiasis of the Clitoris, Labia Minora, and Labia Majora – I; – Line of irregular incision circumscribing the involved area – planned to admit of complete or partial approximation of its margins.

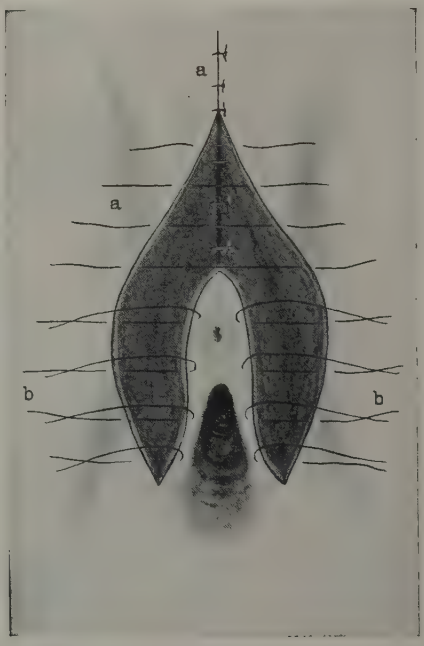


Fig. 5317.—The Same – II; – Suturing the wound; – buried stitches are seen in the upper part of the wound: – a, a, Sutures approximating the upper median part into a vertical straight line; – b, b, stitches closing the two lateral, saddle-bag extensions of the wound – the completed line of suture resembling an inverted Y.

outlined – which will include the clitoris and the bases of the involved portions of the labia – while extending, in pointed fashion, above and below the diseased structures, so as to leave wound margins which can be more readily brought together.

The diseased parts are thoroughly excised, going deeply into their beds – the general appearance of which will be as shown in Fig. 5317. After tying bleeding vessels, margins of the upper median portion of the wound, common to the two saddle-bag sides, are brought together in the median line by transversely placed sutures (v. Fig. 5317, a, a). The margins of each of

the two lateral wounds are then also brought together by transverse stitches (Fig. 5317, **b, b**).

A more or less diffused involvement of the vulval structures may occur in such conditions, for instance, as local tuberculosis of the parts, occupying a pathologic position between benignancy and malignancy _ or in some condition not requiring simultaneous removal of the lymphatics *en bloc*. Figure 5318 may be taken to represent such an involvement _ in connection with which it may not be indicated to dissect the two inguinal lymphatic tracts. In planning the outlines of the circumscribing incisions calculation should

Fig. 5318.—Excision of the Labia and Parts of the Clitoris and Vestibule for Non-malignant Growths Involving Those Parts _ I: _ **abd,** Incision circumscribing the involved structures; _ **c,** non-involved area of the meatus urinarius.

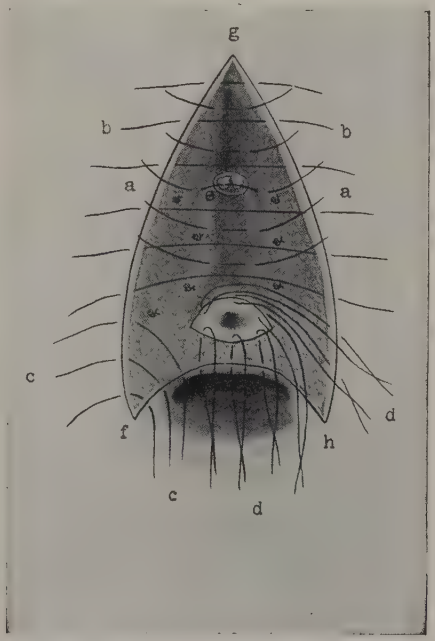


Fig. 5319.—The Same _ II: _ **g,** Bed of the excised area; _ **a, a,** buried sutures are uniting the deeper parts of the wound; _ **b, b,** sutures uniting the upper margins of the wound medially; _ **c, c,** sutures uniting the right lower angle of the wound (in the same way that the left lower angle may be united). Ligated vessels are seen in the bed of the wound. An alternate method of placing sutures is shown at **d, d,** where the stitches are directly approximating the lower median margins _ and are gliding the left lower lateral aspects of the wound, to the margins of the parameatal island of mucosa.

be made to thoroughly remove all the growth, and at the same time provide for as full a covering of the extensively denuded surfaces as possible. The best general line of procedure is, first, to surround the outside limits of the diseased parts by an encircling incision. This will usually take the form of a partial incomplete ellipse or of a complete symmetric ellipse. The incomplete type of ellipse, for instance, might be applied to a case where the fourchet was not involved _ as in the above illustration. The apex of the irregular ellipse would begin at **b,** over the shaved mons veneris _ its two lateral limbs would pass down to **a** and **d** _ and these lower limits would be connected

by an upwardly curved incision passing just above the vaginal outlet and well below the urethral orifice. The urethral orifice would be then surrounded by a much smaller ellipse, whose axis would be vertical, transverse, or the incision might be circular, according to the amount of available sound tissue. All the diseased tissue between the two dotted lines in the illustration is then excised. The complete type of symmetric ellipse might be applied where the entire vulval outlet is involved, including the fourchet – the upper end of the ellipse being upon the mons veneris, and the lower end in the perineum. Then if the urethra outlet were not involved, nor the walls of the vagina, inside of the boundaries of its outlet, these two structures, the meatus and the vaginal opening, would each be surrounded by incisions – and these two inner incisions would mark the inner boundaries of the areas of denudation – just as the outer incision marks the outer boundary.

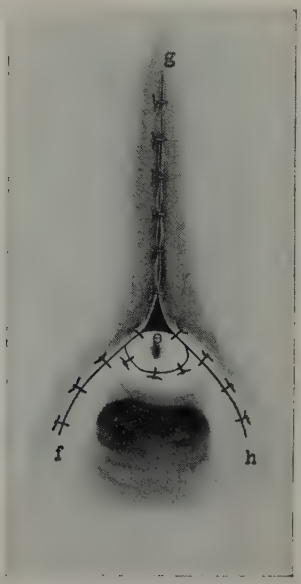


Fig. 5320.—The Same – III; – The finally sutured wound – showing the median direction of the main line of union, the oblique direction of the lateral lines, and a small triangular area, probably impossible to cover by approximation.

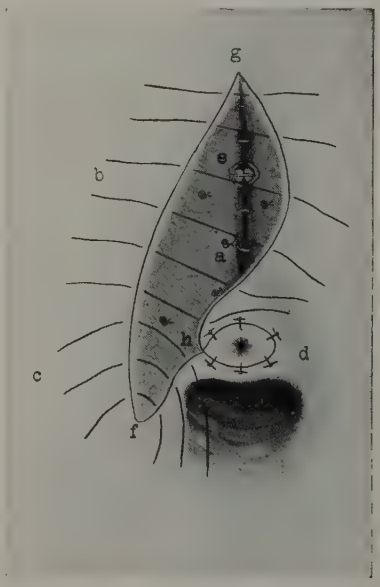


Fig. 5321.—The Same – IV; – An alternate method of suturing: – **g**, The partially sutured bed of the wound; – **a**, buried sutures; – **e**, one of these, controlling the crura of the clitoris; – **h, d**, margins of the meatal mucosa sutured; – **b, c**, remaining sutures, drawing the lateral aspects of the wound together obliquely.

In supposing that we are dealing with the irregular type of elliptic excision of the structures of the vulva – the appearance of the parts following the excision of the labia, most of the vestibule, and the free portion of the clitoris would be as shown in Fig. 5319. Following the freeing of the diseased parts the adjacent skin margins are freely mobilized, so as to allow these margins to be brought as nearly together as possible. Union of the margins is accomplished partly by direct approximation and partly by gliding of the mobilized parts toward the island of sound mucosa surrounding the meatus. When the parts to be removed have been excised, the first step is to ligate with fine catgut all bleeding vessels. The next step is to bring together the deeper portions of the wound by buried sutures (v. Fig. 5320, **e**). The

bringing together of the wound margins is next in order _ part of which is easy _ and part may be difficult _ dependent upon the extent and shape of the denuded areas. The most natural method of suturing is to first approximate, in the median line, the margins of the upper portion of the ellipse to each other _ and the lower wound margin to the lower lip of the parameatal island _ after which the sides of the lower angles of the wound are approximated to each other, and swung inward and sutured to the lateral aspects of the upper margin of the parameatal island (Fig. 5320, **ef** and **eh**) _ usually having to leave a small triangular area to granulate or be grafted.

As an alternate method of suturing, which may sometimes be useful, the following technic may be carried out: _ The lower portion of the union is accomplished by direct approximation (v. Fig. 5321 and Fig. 5319, lower **d**) _ the rest of the circumference of the parameatal island being surrounded by mobilized wound margins brought mediad, from right, or, in this case, left, by combined gliding and swinging (v. Fig. 5319, lateral **d**, and Fig. 5322,

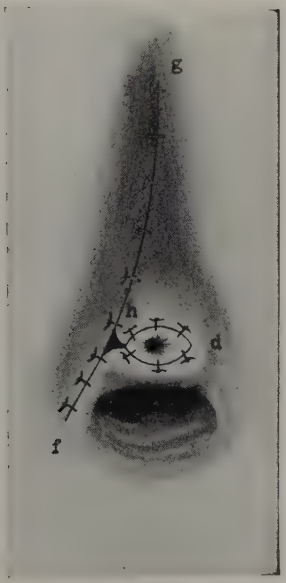


Fig. 5322.—The Same _ V; _ The finally approximated wound in the alternate way of suturing.

d, h). When this is accomplished the entire right margin of the wound is sutured (Fig. 5322, **g, f**) by the stitches **g, b, c, f,** seen in Fig. 5321.

MORE OR LESS TOTAL EXCISION OF THE VULVA AND OF THE INGUINAL LYMPHATIC TRACTS FOR MALIGNANCY OF THE VULVAL STRUCTURES

In operating for malignant involvement of the vulval structures the procedure, to be effective, must be radical _ and not only covers the thorough and wide removal of the visible growth _ but also, and importantly, the removal, in so far as it is possible, of the lymphatics which drain the parts.

In so far as the removal of the lymphatic tracts is concerned, about all that can be practically accomplished is the excision *en masse* of the inguinal lymphatic tracts. This, however, unfortunately does not, in all cases, accomplish the total removal of all the lymphatics which receive lymphatic fluid from the vulva _ for the drainage of some of the lymphatic vessels is

into intrapelvic glands, lying along the large vessel trunks _ and are, practically, inaccessible to removal by the operations ordinarily adopted.

Lymphatic Distribution.—It may be briefly stated as a general summary that: _ (*a*) The lymphatics of the labia majora and minora, including the preputial folds of the clitoris, drain into the inguinal lymphatic glands (going, of course, much more largely to the glands of the same side, but also, to some extent, to the glands of the opposite side); _ (*b*) The lymphatics of the glans clitoridis course through the body of the clitoris and empty into the intrapelvic glands, some passing by way of the femoral canal, some passing over or under the pubic symphysis, and some forming a presymphyseal meshwork; _ (*c*) The lymphatics of the urethra pass into the pelvis, to glands about the external iliac vessels, to the hypogastric glands, and to the sacral glands; _ (*d*) The lymphatics of the anterior part of the vagina pass into the intrapelvic glands.

Fig. 5323.—Total Excision of the Vulva, Exclusive of the Uninvolved Urinary Meatus, Together with the Inguinal Lymphatic Glands of Both Sides _ Beginning with the Excision of the Growth _ II: _ b, The outer oval incision outlying the vulval growth; a, the inner oval incision inlying the growth, but outlying the urinary meatus and the vaginal margin; _ c, c, exposure of the inguinal glands. The ring of involved tissue intervening between the two oval incisions will be excised.

The earlier the growth is attacked, the less distantly and deeply has lymphatic dissemination taken place _ and, hence, the greater likelihood of permanent cure following radical operation. When it is reasonably certain that intrapelvic dissemination has occurred, operation is usually unavailing.

Three types of operative procedure will be described.

Total Excision of the Vulva, Exclusive of the Uninvolved Urinary Meatus, Together with the Inguinal Lymphatic Glands of Both Sides _ Beginning with the Excision of the Growth.—The operation here begins with the removal of the growth included between two oval incisions _ after which the inguinal lymphatic glands of both sides are separately removed through incisions leading outward from the primary wound. The urinary meatus is not involved in the growth. The outer oval incision surrounds the outermost limit of the growth by a wide margin, extending from well

above the clitoris, in front, into the perineum, below, and to the outer sides of the lateral limits of the vulva (Fig. 5323, **a**). The inner oval is placed to the inner side of the growth, but to the outer side of the urinary meatus, and just outside of the vaginal outlet. The tissues, including the growth, which lie between these two oval incisions, are now dissected away and removed *en masse* (Fig. 5323, **b**). As one progresses in these steps, the divided vessels are clamped as encountered – and, on removal of the mass, are tied with fine chromic catgut. The free portion of the clitoris is included in the excision. The bed left by the excision of the oval ring is shown in Fig. 5324.

The inguinal lymphatic glands are now removed from both sides through two incisions extended from the main wound upward and outward, parallel

Fig. 5324.—The Same – III; – The bed left by the excision of the oval ring of vulval tissues – and the outward incisions, extended thence, over the inguinal tracts.

with and extending to and just below Poupart's ligament. The lymphatics and connective tissue of each side should be removed in a single mass. Finally, the two inguinal incisions are sutured. The upper portion of the oval is next sutured in a single median line – and then the outer margin of the remainder of the oval ring denudation is sutured to the margin of the wound surrounding vaginal outlet and the urinary meatus. If temporary drains be anywhere indicated, these should be used.

Total Excision of the Vulva, Exclusive of the Uninvolved Urinary Meatus, Together With the Inguinal Lymphatic Glands of Both Sides – Beginning with the Excision of the Lymphatics.—In this, probably the more surgical procedure, the operation begins with the removal of the inguinal lymphatic glands – which when freed *en masse* are removed in continuity

with the involved tissues surrounded by the encircling incision, which may or may not pass into the perineum. The urinary meatus is not involved in the growth. During manipulations the course of the lymphatics is nowhere crossed by a transverse incision. The encircling incision surrounding the structures to be removed, including the outward extensions through which the inguinal lymphatics are excised, is usually in the form of some modification of two irregularly shaped V's (VV) – their inner limbs bounding the vaginal outlet, and meeting above the urinary meatus – their outer limbs, to the outer sides of the labia majora, diverging outward and upward, to extend parallel with and below Poupart's ligaments, over the inguinal lymphatic tracts – and their upper ends being connected by a curved, transverse incision, crossing the mons veneris. If the vaginal outlet is to be entirely surrounded, the apices of the V's meet in the perineum. The general lines of this extensive incision, which may be modified according to circumstances, are seen in Fig. 5325. In carrying out the manipulations the object is to remove

Fig. 5325.—Total Excision of the Vulva, Exclusive of the Uninvolved Urinary Meatus, Together with the Inguinal Lymphatic Glands of Both Sides – Beginning with the Excision of the Lymphatics – I; – The outline of the vulval and inguinal incisions. The left inguinal lymphatics and areolar tissues have been excised in one mass, continuous with the rest of the tissues to be excised in single block.

the two masses of inguinal glands and connective tissue, together with the sound and diseased structures included within the encircling incisions, in one single piece. The inguinal lymphatics are first exposed by deepening the overlying incisions and retracting their margins – after which the lymphatic glands, lymphatic vessels, and areolar tissue on both sides are all dissected free and excised as one mass – their inner continuity with the rest of the involved tissues being maintained – as shown in the above illustration. The cutaneocellular tissue over the mons veneris is next freed in continuity with the rest of the tissues – this freeing of supravulval tissue being extended

Fig 5326 —The Same _ II; _ The denuded area left after excising the parts. Flaps planned for plastic repair of the area are shown dotted.

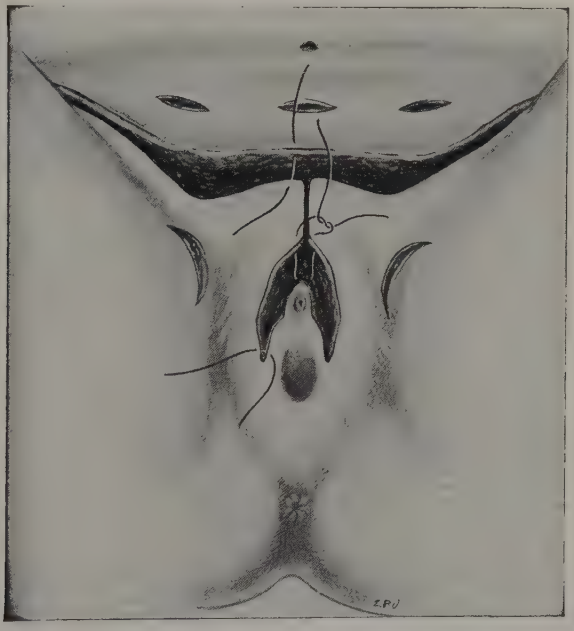


Fig. 5327.—The Same _ III; _ The wound is being sutured. The parts have been approximated as far as possible _ through the aid of extensive undercutting _ relaxation incisions _ and tension sutures. The raw surfaces are grafted _ or left to granulate.

higher than might seem indicated because of the upward course of many of the vulval lymphatics before they turn outward to the inguinal glands. Finally,

the free portion of the supravulval structures is dissected downward, on each side, toward the perineum — until the free end of the clitoris, labia minora, labia majora, and adjacent skin are all excised down to the urinary meatus, the margins of the vaginal outlet, and the perineum — the parts then presenting the appearance shown in Fig. 5326. All bleeding vessels which have been clamped at the time of their division are now tied with catgut.

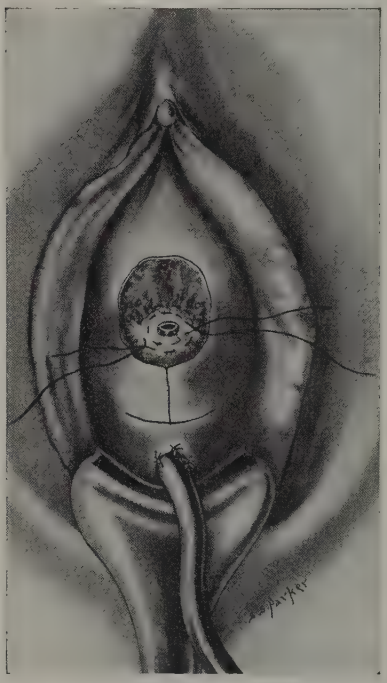


Fig. 5328.—Total Excision of the Vulva, Inclusive of the Involved Urinary Meatus, Together with the Performance of Vaginal Urethrostomy, and the Excision of Both Inguinal Lymphatic Tracts — I; — Having completed the main portion of the operation, an oval incision is made around the semi-isolated piece of mucosa, whose center is the urethra — the lower end of the ellipse being extended in a straight incision down the middle of the anterior vaginal wall to form two flaps — and, through these, the meatus and ending of the urethra are excised. Only this latter part of the operation is here shown — in connection with otherwise normal vulva and vestibule.

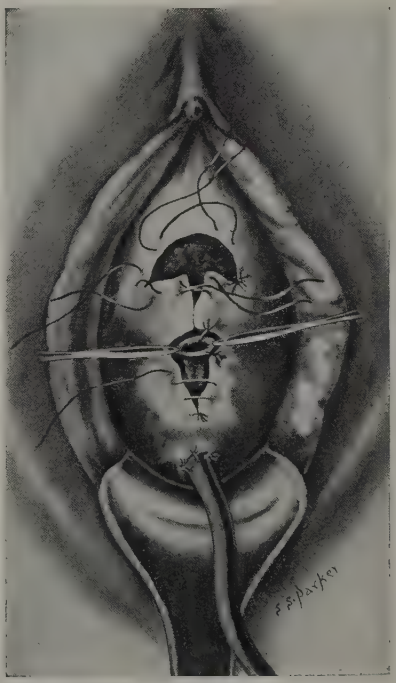


Fig. 5329.—The Same — II; — The meatal end of the urethra has been freed and excised — and the remaining end of the urethra is being anchored into the median line of the anterior vaginal wall. The vaginal flaps, raised from below the urethra, have been displaced about it, and are being sutured together over the space bared by excision. All margins are brought together by suturing as nearly as possible — the residue being left to granulate.

As much of the extensive wound as can be brought together by suture is now closed. There will usually be no difficulty about bringing together the lower paravaginal margins of the wound — nor the outer ends of the inguinal incision — by ordinary measures — but the rest of the margins can generally be only partially approximated. By extensive undercutting of the skin margins by making relaxation incisions, and by the use of tension sutures, a considerable additional approximation is possible. Especially should effort be made to close in, as nearly as possible, the margins of the tissue about the

urinary meatus and vaginal outlet. The wound, thus treated, will present an appearance approximating that shown in Fig. 5327. The uncovered areas must be grafted or be left to granulate. If limited temporary drainage be anywhere indicated, this is installed.

Total Excision of the Vulva, Inclusive of the Involved Urinary Meatus _ Together with the Performance of Vaginal Urethrostomy and the Excision of Both Inguinal Lymphatic Tracts.—The operation is here performed, in every respect, as in either one of the preceding technics _ except that, in addition, the urinary meatus and the immediately adjacent part of the urethra are removed _ and the distal end of the proximal portion of the urethra is anchored into the anterior vaginal wall. Following the rest of the operation _ or sometimes, preferably, before the rest of the operation

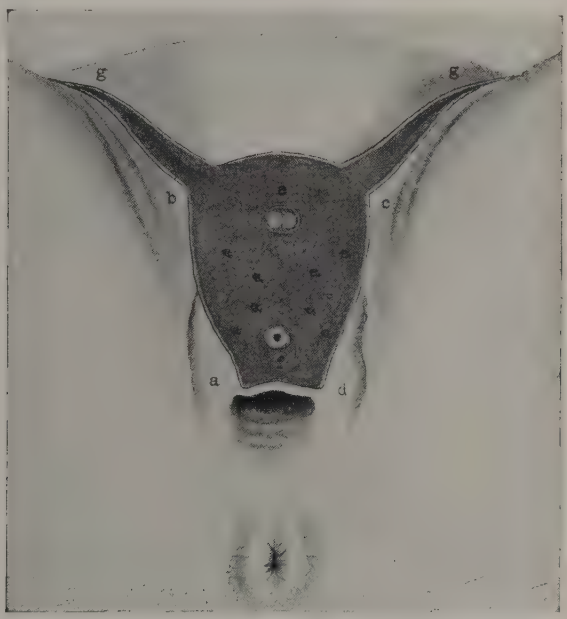


Fig. 5330.—Excision of the Larger Part of the Vulva, Including Part of the Clitoris and Urinary Meatus, and Exposure of the Inguinal Lymphatics, for Malignant Involvement _ I: _ **abcd,** Bed of excised area; _ **e,** crura of the partly excised clitoris; _ **f,** partially excised meatus; _ **g, g,** gaping lines of incision extending from **b** and **c,** of the main wound, upward and outward into the folds of the groins, to expose the inguinal lymphatics. Ligated vessels are seen in the bed of the wound.

is begun _ the meatus and terminal portion of the urethra are excised and the urethrostomy made. Supposing, in the present instance, that the rest of the operative steps have been carried out, as heretofore described, the resulting appearance of the parts will be as shown in Fig. 5328. The urethral orifice and its adjacent mucosa are then surrounded by an oval incision as there shown, carried along the outer margins of the mucosal peninsula _ the sides of the lower aspect of the oval incision meeting in a vertical line well below the meatus, and extending a short distance down the middle of the anterior vaginal wall. Through this incision, deepened, the meatus and ending of the urethra are exposed in the same way as already described under the excision of the female urethra _ after which the urethra is divided (the distal portion being discarded), and the distal end of the proximal portion is anchored into the middle line of the anterior wall of the vagina (Fig. 5329). The median

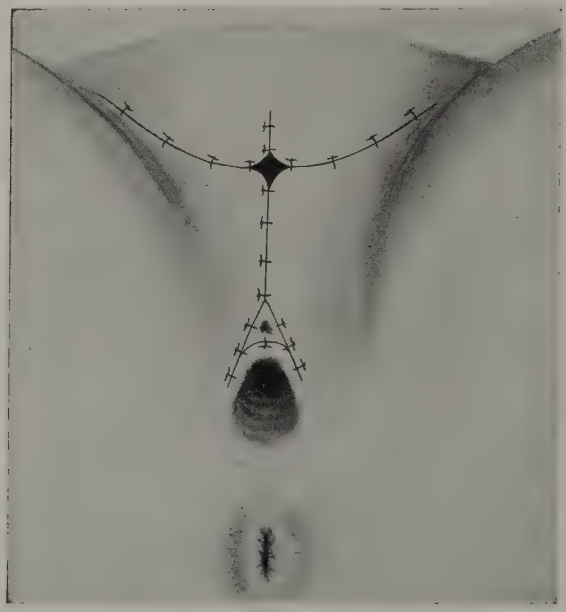


Fig. 5331.—The Same – II; – Showing the method of suturing the preceding wound. The main wound, after the insertion of a few buried sutures to approximate the deeper parts and undercutting the margins, is sutured vertically. The lower aspect of the vaginal wound is sutured to the lower aspect of the border of the partially excised meatus (thus rolling out the latter), and the lower sides of the main wound, to the sides of the meatus – the meatal mucosa being drawn out into a somewhat triangular form in the act somewhat exaggerated here – the triangle being sometimes left in part to granulate. The inguinal wounds are separately sutured – probably leaving a squarish or triangular surface to granulate at their junction with the vertical wound.

Fig. 5332.—Excision of Larger Part of Vulva, with Parts of Clitoris and Meatus Urinarius, for Malignant Growths – I: – abcd, Main area of excision, showing partially excised clitoris and meatus, together with small ligated vessels; – ef, angular incisions of relaxation made on each side of the main wound; – gh, gaping incisions extending outward from the upper part of the main wound to expose the inguinal lymphatics.

vaginal incision, above this anchorage, through which the urethral excision took place, is then closed _ the urethra now opening upon the vaginal wall instead of upon the vestibular wall. The general expanse of wound is then closed as in the preceding procedures _ the parts presenting the appearance

Fig. 5333.—The Same _ II; _ The wound-beds sutured. Approximation of the lateral margins of the main wound in the median line and around the meatus, by gliding, after closing the depths of the wound by buried sutures. The outer parts of the angular wounds are then closed as straight horizontal lines. The inguinal wounds are closed, from the main wound, outward.

seen in Fig. 5329. A rubber catheter is carried into the bladder and fastened to the vaginal mucosa near the urethrostomy opening.

Comment.—Other forms of incisions and closures are shown in Figs. 5330 and 5331.

CHAPTER LXXXVI

OPERATIONS UPON THE VAGINA, INCLUDING THE PERINEUM

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Excision of small cystic and benign tumors of the vagina, p. 158; _ Incision or excision of vaginal bands, p. 159; _ Operation for annular constriction of the vagina, p. 160; _ Operative treatment for stenosis of the vaginal outlet or for vaginismus, p. 163; _ Operation for atresia vaginæ, p. 166.

Operations for absence of the vagina, in general, p. 169; _ Operations for absence of the vagina, in detail, p. 170.

Operations for laceration and relaxation of the vagina and perineal body, in general, p. 184; _ Operation for recent vaginoperineal or vagino-perineo-rectal laceration, p. 190; _ Intermediate operation for vaginoperineal or vagino-perineo-rectal lacerations, p. 191; _ Operation for vaginoperineal laceration and relaxation by Tait's flap-splitting method, p. 191; _ Operation for vagino-perineo-rectal laceration, and relaxation, by Tait's flap-splitting method, p. 201; _ Operation for vaginoperineal laceration and relaxation by Emmet's mediobilateral or "butterfly" denudation, p. 209; _ The same operation for vagino-perineo-rectal laceration and relaxation, p. 217; _ Operation for vaginoperineal laceration and relaxation by median denudation, p. 224.

SURGICAL ANATOMY OF THE VAGINA

Description.—The vagina is a passage communicating, above with the uterus, and extending downward and forward to the vulval opening _ lying in the pelvic cavity (with whose general axis it corresponds), between the bladder in front, and the rectum, behind. In its undescended state its walls are in contact _ and, on cross-section, presents the form of an H (with its transverse limb, somewhat forward, or backward, bringing the anterior and posterior walls into contact and the lateral limbs turning their convexity mediad). It is narrowest at its two ends and widest at its center. The anterior and posterior fornices consist of reflections of the vaginal on to the uterine mucosa at its upper end _ the vagina completely surrounding the neck of the uterus, but extending much further beyond the posterior lip of the cervix (about 2 cm., or $\frac{3}{4}$ inch) than beyond the anterior lip. The posterior fornix is much deeper therefore than the anterior. Its lower end passes through an orifice in the triangular ligament and opens into the urogenital cleft, below the urinary meatus, and between the labia minora. The length of its anterior wall is about 6.3 cm. ($2\frac{1}{2}$ inches) _ and of its posterior wall, about 9 cm. ($3\frac{1}{2}$ inches). The vaginal orifice in the virgin is usually partly closed by the hymen. The walls of the vagina are composed of an internal mucous coat _ outer muscular coat _ and an intermediate coat of erectile tissue (connective tissue, veins, and muscle-fibers).

Relations.—Anteriorly: Base of bladder _ loose subperitoneal fascia intervening. Urethra _ subperitoneal areolar tissue intervening in upper third, but closely connected in lower two-thirds. Ureters _ which enter bladder 3.2 cm. ($1\frac{1}{4}$ inch) below level of os uteri. **Posteriorly:** Rectum _ Douglas' peritoneal culdesac intervening for about 2.5 cm. (1 inch) above _ and subperitoneal areolar tissue intervening lower. Perineal body _ below (separating vagina and rectum). **Laterally:** _ Vaginal branch of uterine artery. Subperitoneal venous plexus at base of broad ligament. Ureters crossing upper third obliquely. Levatores ani in relation with lower two-thirds.

Arteries.—Branches of the vesicovaginal artery; vaginal branch of the uterine; branches of the internal pudic; branches of the middle hemorrhoidal.

Veins.—Correspond with the arteries, forming rich venous plexuses surrounding the vaginal walls, and passing to the internal iliac veins.

Lymphatics.—Networks of lymphatics are found in three sets, below the mucosa, in the muscularis, and around the vaginal wall. The lymphatics from the upper third of the vagina empty into the external iliac glands, those from the middle third of the vagina, into the internal iliac glands, and those from the lower third, into the lateral sacral glands.

Fig. 5334.—Semidiagrammatic Anatomy of the Vaginoperineal Musculature: a, Transversus perinæi muscle; b, levator ani (the vaginoperineal sling, formed by the two levatores ani, is shown split in the middle, by such a tear as lacerates the perneum); c, rectum; f, obturator internus; e, gluteus maximus.

Nerves.—From the third and fourth sacral nerves of the spinal system, and from the uterovaginal and vesical plexuses of the sympathetic.

SURGICAL ANATOMY OF THE FEMALE PERINEUM AND PERINEAL BODY

Definitions.—Confusion sometimes arises in the use of terms, the understanding of which may be aided by the following:

Perineum, is occasionally described, differentially from the perineal body, as the space, or area (stretch of skin) intervening between the posterior

boundary of the vagina, in front, and the anterior boundary of the anus, behind. More correctly, it should be regarded either synonomously with the perineal body, or as the cutaneous base, or surface of the perineal body, with whose lateral limits it corresponds.

Perineal Body – the solid triangular or wedge-shaped mass of fibrofatty and muscular tissues, along with their vessels and nerves, which is placed between the vagina, in front, the rectum posteriorly, the levatores ani muscles, above, and the perineal surface, below.

Pelvic Outlet – a more or less lozenge-shaped area, bounded, anteriorly, by the symphysis pubis and subpubic ligament – posteriorly, by the tip of

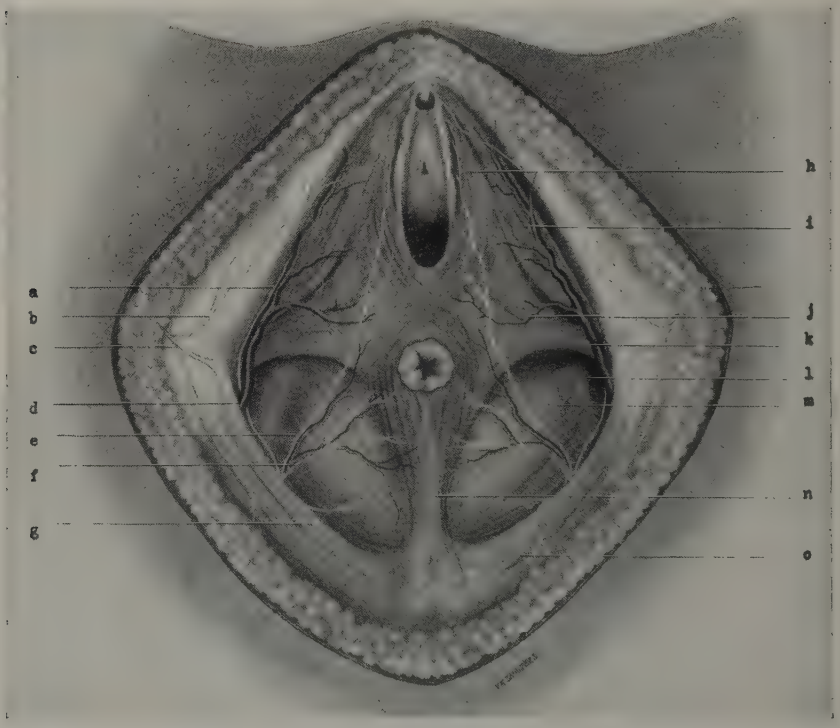


Fig. 5335.—Anatomy of the Female Superficial Perineum: – **a**, Muscular branch of perineal branch of pudic n.; – **b**, inferior pudendal branch of small sciatic n.; – **c**, perineal cutaneous branches (rami perineales) of small sciatic n.; – **d**, superficial perineal branch of internal pudic a. and v.; – **e**, perineal branch of pudic n.; – **f**, inferior hemorrhoidal a., v., and n.; – **g**, gluteal cutaneous branches (n.n. clunium inferiores) of small sciatic; – **h**, sphincter vaginæ m.; – **i**, erector clitoridis m.; – **j**, transverse perineal a. and v.; – **k**, superficial transverse perineal m.; – **l**, "white line"; – **m**, levator ani m.; – **n**, sphincter ani m.; – **o**, gluteus maximus m. (Modified from various Anatomies.)

the coccyx – and, laterally, from before, backward, by the conjoined rami of the pubes and ischia, the ischial tuberosities, and the great sciatic ligaments (overlapped by the great gluteal muscles).

Pelvic Floor – the soft structures which close the pelvic outlet – and which is pierced, in the middle line, by the meatus urinarius, vagina, and anus.

Summary – Many Anatomists give the "female perineum" the same boundaries as above given to the pelvic outlet, making no difference between them – while most Gynecologists give it the boundaries conjointly described above under the perineum and the perineal body. In the present writings the struc-

tures above described under the perineum and the perineal body will be simply considered under the single term "perineal body."

Boundaries of the Perineal Body.—Anteriorly, the posterior vaginal wall: – Posteriorly, the anterior rectal wall; – Laterally, the ischial tuberosities; – Superiorly, the levatores ani; – Inferiorly, the superficial (cutaneous) perineal surface indicated by these boundaries.

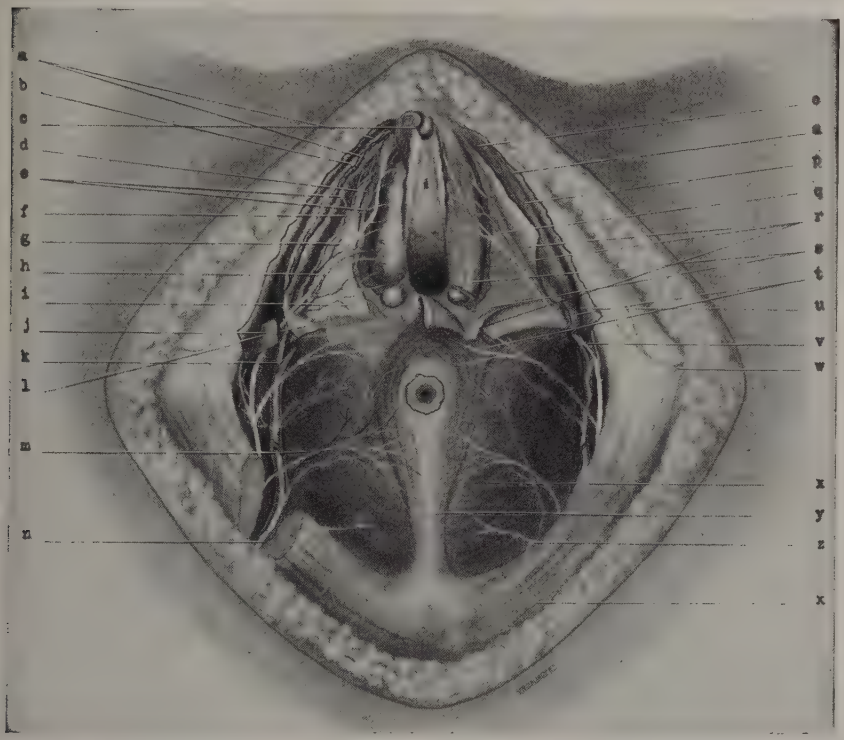


Fig. 5336.—Anatomy of the Female Deep Perineum: – **a, a,** Superficial perineal fascia; – **b,** crus clitoridis; – **c,** clitoris, with dorsal a., v., and n.; – **d,** cut deep transverse perineal muscle; – **e,** superficial layer of triangular ligament; – **f,** artery of corpus cavernosus (a. profunda clitoridis); – **g,** perineal branch of pudic n.; – **h,** artery of bulb; – **i,** deep layer of triangular ligament; – **j,** internal pudic artery and veins, passing through layer of triangular ligament; – **k,** cut superficial layer of triangular ligament; – **l,** superficial layer of triangular ligament; – **m,** inferior hemorrhoidal a., v., and n.; – **n,** internal pudic a. and v's., seen through cut gluteus maximus muscle; – **o, p,** erector clitoridis muscle; – **q,** deep transverse perineal m.; – **r,** superficial layer of triangular ligament; – **s,** sphincter vaginæ m.; – **t,** cut superficial transverse perineal m.; – **u,** superficial perineal a.; – **v,** internal pudic a.; – **w,** perineal cutaneous and inferior pudendal branches of small sciatic n.; – **x,** levator ani m.; – **y,** sphincter ani m.; – **z,** gluteal cutaneous brances (n.n. clunium inferiores) of small sciatic n.; – **x,** (lower) gluteus maximus. Transverse perineal vessels are seen given off just above the inferior hemorrhoidal vessels. The vaginal bulb and vulvovaginal gland are shown upon the superficial layer of the triangular ligament, beneath the sphincter vaginæ muscle. (Modified from various Anatomies.)

Surface Dimensions of the Perineal Body.—About 3.2 cm. ($1\frac{1}{4}$ inch), from before backward – and extends, laterally, from one ischial tuberosity to the opposite.

Transverse Perineal Septum.—A strong, resistant septum, crossing transversely behind the posterior commissure – composed of connective tissue, considerable yellow elastic tissue, and muscle-fibers – into which the voluntary perineal muscles are inserted.

Muscles of the Perineum.—These, as described by many Anatomists regarding the boundaries of the perineum as given above, are the following: transversus perinei superficialis, sphincter vaginæ, erector clitoridis, and compressor urethræ.

EXCISION OF SMALL SOLID AND CYSTIC BENIGN TUMORS OF THE VAGINA

The most frequent solid benign tumors of the vagina are fibromata and myofibromata. Tumors of moderate size, involving the vaginal wall, are apt to be either pedunculated or sessile.

In removing pedunculated solid tumors the constricted base of the tumor can usually be exposed by the retraction of the lips of the vagina after

Fig. 5337.—Excision of a Fibroma of the Vagina; Two flaps of mucosa are turned back at the junction of the base of the pedicle with the vaginal wall which are then sutured over the transversely divided and ligated pedicle of the tumor.

Fig. 5338.—Excision of a Vaginal Cyst; An elliptic incision, extending beyond the opposite poles of the cyst, is carried over the bulk of the tumor through which it is removed by forceps and curved blunt-pointed scissors.

which the pedicle is surrounded by an elliptic incision in the manner shown in Fig. 5337. The mucosa is then peeled back in the form of two small flaps. If the pedicle be quite small, it may be ligated with chromic catgut and divided and the two small flaps be brought together by fine catgut over the small stump. If the pedicle be larger, it may be divided by a wedge-shaped cut, after turning back the two mucosal flaps the vessels of the divided stump caught and tied and the mucosal flaps be brought together over the stump.

In removing solid sessile tumors of the vaginal walls of moderate size the usual method of procedure is to make either a linear incision over the tumor, and enucleate it through this, after dissecting off its coverings or to make an elliptic incision just as in removing a cystic tumor, about to be described,

and, retracting the outer margins of the ellipse, enucleate the tumor, together with the included ellipse of mucosa.

In removing very large solid tumors, especially if extensive bases are present, it may be necessary to temporarily incise the vaginal outlet in order to secure necessary accessibility for manipulation.

Cystic tumors of the vagina (which usually arise, according to Kelly, from Gaertner's ducts, from the vaginal glands, or from epithelial nests in scar tissue) may be treated along the same general principles as just mentioned in connection with solid tumors. Enucleation of the unopened cyst by elliptic incision (Fig. 5338) is the general preferable method of procedure. It will sometimes happen, however, that the cyst cannot be removed in its entirety – either that such removal cannot be undertaken, or, if undertaken, the cyst wall may be ruptured. In such cases the ruptured or purposely incised cyst wall must be carefully dissected from its bed so that no new cyst formation

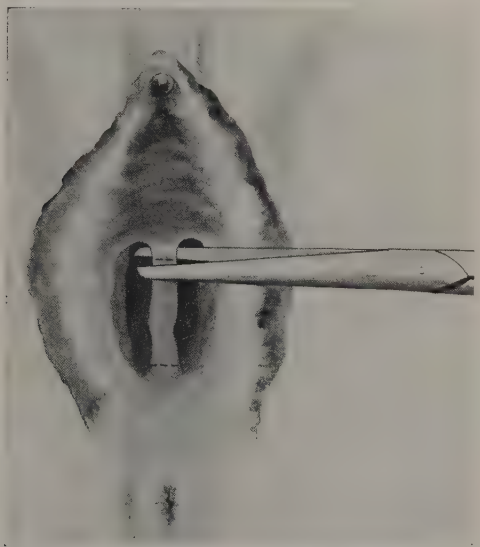


Fig. 5339.—Excision of an Obstructing Vaginal Band; – Scissors in the act of dividing the band at its upper and lower ends.

may occur. The wound from which a non-infected cyst has been removed should be closed – first, if large, by buried catgut sutures, and finally, the margins, with catgut or silk.

INCISION OR EXCISION OF VAGINAL BANDS

Bands of congenital origin or bands following pathologic conditions and resulting in adhesions may more or less block the vaginal outlet, or bind together vaginal surfaces, or uterovaginal walls.

Such a condition is shown in Fig. 5340.

The frailer type of bands may often be simply incised or excised. In other instances the divided surfaces of more extensive adhesions, or the remaining aspects from which bands have been excised, may either have to be ligated – or, better, where the divided structures are of some thickness, be brought together by suture. Where the restoration of the part by suture

Fig. 5340.—Incising of Fibromucous Uterovaginal Band.

is anticipated, the liberating section should be so planned as to leave parts whose margins may be conveniently and accurately approximated by suture.

OPERATION FOR ANNULAR CONSTRICTION OF THE VAGINA

The formation of annular bands constricting the caliber of the vagina in some part of its course sometimes occurs as the result of trauma, in childbearing, in violent or forced sexual intercourse, and in masturbation with rough objects – and sometimes results from forms of vaginitis. The tendency following such causative factors in action upon such a canal is to result in varying degrees of stricture, or constriction – and, occasionally, as described under the operative relief of vaginal septa, in complete obliteration of the vaginal lumen at the site involved. In these cases the principle involved is the same as in the case of stricture formation in the male urethra – there, however, apt to be much more marked because of the smallness of the caliber of the canal.

Much that has already been said as to vaginal septa also applies here.

In proportion as the constricting vaginal ring is of small depth, and low down in the vagina, is the surgical problem easier than in cases where the stricturing ring or band is deeper in extent, and higher up the vaginal canal in situation.

The practical difference between a complete vaginal septum, and even a marked annular constriction of the vagina, is, that in the former, no canal exists – and, in the latter, a canal of at least some degree of lumen connects the upper with the lower patulous portions of the vaginal tract. It is the presence of this lumen which makes the preliminary determination of the exact site and the exact depth of the annularly constricting band determinable – by the passage of a crooked or probe-pointed sound and partly withdrawing it. Without this, one would be in the dark as to whether the amount of tissue to be cut through would not prohibit the type of operation planned. And if no lumen were present, the case would resolve itself practically into

one of absence of the vagina or of a large portion of the canal. Much that has been said of operating for vaginal septum (v. p. 166) applies here.

Operation for Annular Constriction of Large Caliber Low in the Vagina.—In these cases the caliber of the vaginal canal may not be much encroached upon, and if the depth of the annular band be not too great to preclude the possibility of suturing the cut mucosa above to the cut mucosa below, and if the band be situated near the outlet of the vagina, the operative technic may not be difficult. The vaginal outlet being well retracted, the free aspect of the ring or band is seized with angular forceps and brought within lower reach. A circular incision is made from within the vagina, around the vaginal wall, at the junction of the lower limit of the band with the wall. The band while being drawn downward is mobilized by combined sharp and blunt dissection carried on between it and the muscular wall of the vagina until a level is reached represented by the junction of the upper limit of the band and the vaginal wall, when another circular incision is made, this

Fig. 5341.—Operation for Annular Constriction of the Lower Vagina; The outer and inner margins of the remnant of the retracted limits of the excised annular ring or band are sutured together in the form of a circular vaginorrhaphy.

time from outside the mobilized band into the vagina. As a result of this technic a ribbon of raw surface will be left surrounding the vagina at the junction of the band with the vaginal wall. This raw band is closed by suturing the upper free margin of the wound to the lower free margin (Fig. 5341). If the annular band removed have been of such width that it is difficult or impossible to approximate the resulting margins, these may be undercut, so that when thus mobilized their free borders may be brought together (Fig. 5342).

Operation for Annular Constriction of Small Caliber Higher in the Vagina.—The difficulties are, of course, all increased when the constricting band is situated higher up in the vaginal canal, and when it is of greater depth and smaller lumen. When these conditions, however, are present in only moderate grade, an attempt may be made to apply the same technic as just described. In such an instance as illustrated in Fig. 5343 the lower circular incision around the vaginal wall just below the lower level of the constricting

band will correspond with **be**. The lateral walls of the constricting band are then mobilized by undercutting along circumferential lines corresponding

Fig. 5342.—Operation for Annular Constriction of the Lower Vagina Requiring Extensive Mobilization to Approximate the Cut Margins of Mucosa; – The band of contracted tissue near the vaginal outlet is circularly excised – after which the adjacent vaginal wall is undercut, and the mucosa above sutured to the mucosa below (after the technic of Whitehead's radical operation for anorectal hemorrhoids).

Fig. 5343.—Operation for Small-calibered Annular Constriction of the Middle Vagina: – **a, a,** Mass of fibrous tissue obstructing the vagina, save for a drainage canal of small lumen. After excising this mass along the lines **bcde** the margins of the vagina are undercut from **b** to **f, c** to **g, d** to **h,** and **e** to **i.** The vaginal wall is then circularly sutured, **cd,** above, to **be,** below – the approximation being accomplished by traction upon the undercut tissues.

with **bc** and **ed** – until the parts can be drawn down far enough to slip curved scissors upward inside of the muscular coat along the lines **bc** and **ed** until the mucosa can be circularly divided at the level **cd**. Downward traction

of the parts may be accomplished either by directly grasping them with tenaculum forceps, or by carrying a uterine sound, with its tip bent at a sharp, short angle, through the small lumen — and, with this, excersise traction from above the constricting band downward. Following the removal of the band, the adjacent vaginal walls, just above and just below its position, may require a considerable degree of mobilization in the submucosal plane before its margins can be brought together by suture — extending the undercutting in the positions indicated by **cg, dh, bf,** and **ei.**

If it be found impracticable to conclude the operation by the vaginal route alone — or even to undertake it solely through the vagina — then one may resort to the combined intravaginal and intra-abdominal routes — as described in operating for totally absent vagina by the combined routes (v. pp. 175–184).

OPERATIVE TREATMENT FOR STENOSIS OF THE VAGINAL OUTLET OR FOR VAGINISMUS

The vaginal outlet may be abnormally obstructed by either anatomic or functional cause, or by both. Anatomic obstruction may be due to an

Fig. 5344.—Vaginoperineoplasty for Vaginismus, or Contracted Vaginal Outlet, by Two Oblique Vaginoperineal Incisions — Pozzi — I: — **a,** Knife making deep incision from within the vagina, obliquely outward, onto the perineum; — **b,** the completed corresponding incision upon the opposite side.

Fig. 5345.—The Same — II: — **a,** The incised bed, in the act of being sutured in a direction the reverse of the original incision; — **b,** the corresponding opposite incision sutured — its line now running at a right angle to that of the original incision — thus increasing the dimensions of the vaginal outlet.

unusual type of hymen (which is considered at p. 138) — or may be due to a congenitally too small vaginal opening — or may be caused by an unusually developed and unyielding perineum. The most frequent functional cause of narrowing of the vaginal opening, intermittently in action, is vaginismus (a

condition of spasm of the more anterior portion of the levatores ani muscles). An anatomically small vaginal outlet and vaginismus may coexist. In the cases due to vaginismus the cause is frequently not ascertainable, the condition being ascribed to a neurosis _ while in other instances the spasm may be due to such lessions as fissures, ulcers, caruncles, and the like, of the vulval structures, or to anal fissures, fistulæ, hemorrhoids, and the like. Where a cause can be located, this should, of course, be first removed _ when no other procedure may be necessary.

When operation is performed for obstructed vaginal outlet, whether due to an actual barrier or to spasm, the technical procedure is very much the same. Prior to operation dilatation may be tried _ by wearing increasing sizes of some form of vaginal dilators while in bed during the night _ the

Fig. 5346. — VAGINOPERINEOPLASTY FOR VAGINISMUS, OR CONTRACTED VAGINAL OUTLET, BY DEEP Y-SHAPED INCISION _ Sims _ I: _ ab, Lateral incisions into the vaginal sulci; _ c, median incision into the perineum.

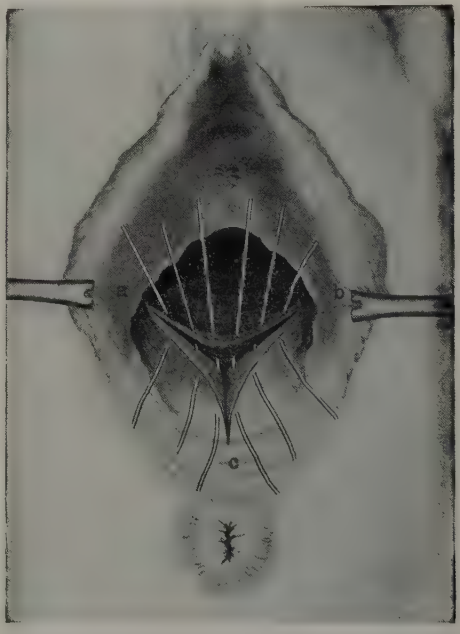


Fig. 5347.—The Same _ II; _ The enlargement of the vaginal outlet is secured by suturing the Y-shaped incision with axially placed stitches, so that the curved lip, ab, of the now triangular wound, is sutured to the subtending lips of the triangle.

instrument being introduced after the application, if necessary, of cocain ointment. If these measures fail _ or, independently of them _ some form of some degree of division of the sphincteric control of the vaginoperineal outlet may be performed.

Vaginoperineoplasty for Vaginismus, or Contracted Vaginal Outlet, by Two Oblique Vaginoperineal Incisions Sutured in the Opposite Direction.—Two oblique incisions, directed from within outward, are made in the floor of the vagina, extending downward and outward, more or less into the confines of the perineum (Fig. 5344, a and b). These incision are then sutured in the reverse direction (Fig. 5345, a and b). A corresponding increase of opening will be thereby secured _ the cuts being more superficial in minor cases and deeper in more marked cases.

Vaginoperineoplasty for Vaginismus, or Contracted Vaginal Outlet, by Deep Y-shaped Vaginoperineal Incision, Followed by Anteroposterior Suturing.—The two separating limbs of the Y here run in directions the reverse of those in the last method – that is, they parallel the boundaries of the vaginal opening instead of crossing them at right angles (Fig. 5346, **a** and **b**). From the point of their union a median incision is carried into the perineum (v. Fig. 5346, **c**). These incisions are made as deep as may be indicated in the individual case. The increase and relaxation of outlet is then secured by the method of suturing, in which the shorter margin, **ab**, is sutured to the longer margin, **abc**, – Fig. 5347. Sometimes the vertical portion of the incision alone is made, followed by suturing in the same plane as just described.

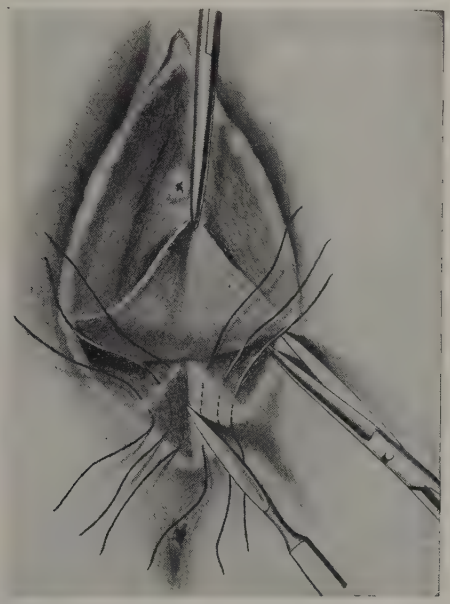


Fig. 5348.—Vaginoperineoplasty for Vaginismus, or Contracted Vaginal Outlet, by Vaginoperineal Flap-splitting and Median Perineotomy – I; – The posterior vaginal flap has been raised – the perineum, including the sphincteric structures, medially divided – and sutures are being applied in such a manner as to approximate the margins of the upper half of the diamond-gap to the margins of the lower half.

Vaginoperineoplasty for Vaginismus, or for Contracted Vaginal Outlet, by Vaginoperineal Flap-splitting and Median Perineotomy.—This procedure, described by Eden and Lockyer, is, in part, just the reverse, in principle, from the flap-splitting operation for laceration of the perineum. In the latter the vaginal flap is raised, and the already long since severed perineal tissues are brought together by transversely placed sutures. In the present instance a vaginal flap is raised from the posterior vaginal floor (Fig. 5348), after which a median incision of about 5 cm. (2 inches) is made through the perineal tissues, beginning just above the position of the hymen, and ending midway between the vaginal outlet and anus. The sphincter muscles are thus divided – and the structures then gape apart in diamond shape. This wound is now sutured with chromic catgut in such a way as to approximate the upper lip of the diamond to the lower lip (anteroposteriorly

or parallel with the long axis of the vagina), rather than the lateral lips to each other (transversely or crossing the long axis of the vagina) (v. Fig. 5348). This approximation of the deeper parts is made with buried sutures and is carried on up to the mucocutaneous level. Finally, the vaginoperineal mucocutaneous margins of the wound are united by sutures placed in the same direction as the buried stitches (Fig. 5349). A vaginal rest is inserted and worn during healing.

Vaginoperineoplasty for Vaginismus, or Stenosed Vaginal Outlet, by Median Vaginoperineal Incision, Which is Then Stretched Transversely and Sutured Anteroposteriorly.—The vaginal outlet may be contracted by an unusually thick and forwardly extending perineum, entirely independently of the element of vaginistic spasm – the obstruction, in other words, being more structural than functional – although both may coexist. The principle of the Mikulicz-Heineke pyloroplastic operation may be here

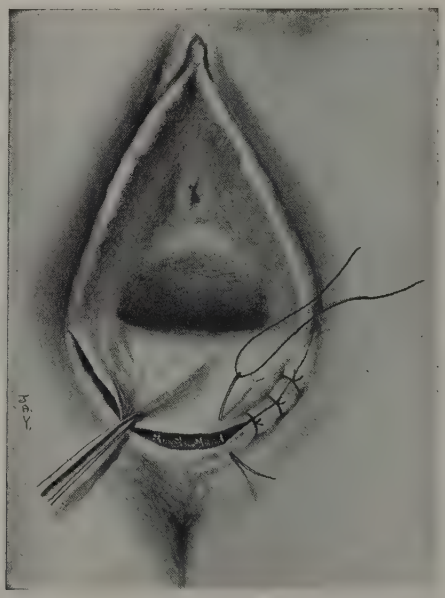


Fig. 5349.—The Same – II; – The posterior vaginal flap has been brought down, and its mucous margin is being sutured to the cutaneous margin of the perineum. The underlying sutures are in evidence.

applied in securing relief. A median incision is made, from and including the posterior vaginal outlet, above, and extending downward into the perineum as far as the special case may seem to require – and passing well into the connective-tissue plane. The median wound is now stretched by seizing the middle of each wound margin and drawing it outward, so that its original ends are approximated, and its new direction now made transverse. While held in this position anteroposteriorly placed sutures are made to approximate the margins in their new relations. In the finally sutured wound the increased circumference of the opening is appreciated.

OPERATION FOR ATRESIA VAGINÆ

Atresia of the vagina is usually the result of trauma received during labor – followed by the growing together of the raw, or granulating parts, over a greater or less extent of opposite aspects of a certain segment of the circum-

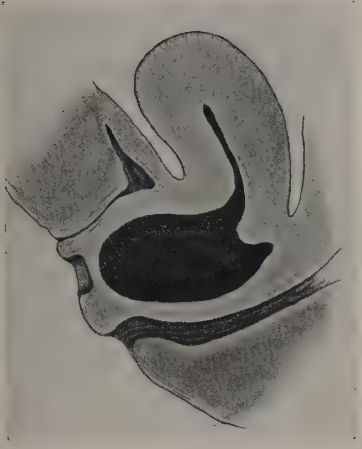


Fig. 5350.—Hematocolpos.

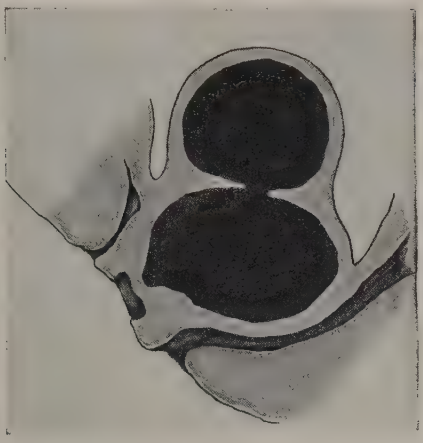


Fig. 5351.—Hematocolpometra.

Fig. 5352.—Operation for a Thin Vaginal Septum by Simple Incision and Excision; – The septum is first divided vertically in the solid line – after which the margins of the septum are grasped with forceps and the entire membrane excised, near its base, along the dotted line.

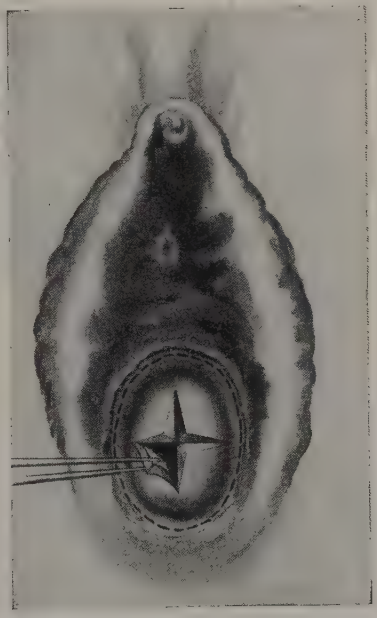


Fig. 5353.—Operations for a Thick Vaginal Septum by Crucial Incision, Followed by Suturing – I; – The vaginal barrier is first crucially incised – and then circumferentially excised.

ference of the vaginal tube. The existence of a complete septum may also constitute the condition of atresia. An imperforate hymen also constitutes vaginal atresia.

The most pronounced phenomena of complete atresia during menstrual life is the complete blockage of the vagina to the outflow of menstrual blood _ and, indeed, is usually the cause of its discovery. The amount of accumulated blood may have had time to distend only the vagina, constituting hematocolpos (Fig. 5350) _ or it may have filled the vagina, and then distended also the uterus, constituting hematocolpometra (Fig. 5351) _ and in extreme cases it may even distend vagina, uterus, and both fallopian tubes.

From the operative standpoint it is of practical importance to make sure that the absence of passage of menstrual blood is really due to more or less limited blockage in some part of the vaginal canal _ rather than due to an absence of the upper portion of the vagina _ as the technical procedure for relief of the latter condition is considerably more of a major undertaking. The mere reaching of the lower limit of the obstruction by a finger in the vagina is non-conclusive. The only definite way of recognizing the presence

Fig. 5354.—The Same _ II; _ Seen in axial section; _ the margins of the wound, left after excising the septum, are being sutured.

of a patulous vagina above the barrier which is supposed to be a transverse septum rather than a non-developed or absent upper vaginal tract, is the proof secured by finding a fluid tumor just above the barrier, and which must occupy the position of the vagina _ as verified by an exploratory needle carefully introduced through the septum, measuring at the same time the depth of penetration _ or by combined examination through the rectum and as much of the vagina as may be entered _ or, better still, if feasible, is the bidigital examination made by the right thumb within the rectum and the index passed through the dilated urethra, as practised by Kelly. (The Author would suggest that it might be possible to secure the same information with less risk of damage by substituting a male urethral sound for the finger in the bladder, reversing the position of the sound after introducing it, and bringing its tip into relationship with the rectal finger, and estimating the structures which intervene.) Sometimes septa partition off the distended vagina into secondary cavities.

Operation.—A number of deaths have been reported following the apparently simple operation for the relief of this condition — due to infection, which is particularly prone to take place in the rapid decomposition of the fluids which take place in the distended vagina, uterus, and tubes following operation. Every care, therefore, should be taken to avoid this chief danger.

In some cases much information may be secured by an exploratory needle, and subsequent steps be guided thereby. In other instances incision may be made directly. In the case of a thin, bulging septum, a median vertical incision may be made (Fig. 5352) — at first sufficiently long to admit an examining finger — and then increased to the limits of the vaginal wall. After the escape of the blood, which is only allowed to flow away slowly so that the distended structures may gradually regain their caliber, the incised margins may be seized with forceps and the circular base of each half-oval be cut away with curved scissors. It may not even be necessary to repair the site of a very thin membrane which has been excised.

In the case of a stouter, thicker septum it is generally best, after having exploratorily determined its nature, to crucially incise the septum (Fig. 5353). Then, after the collected blood has drained away, each quadrant of the septum is seized with forceps excised at its basal attachment to the vaginal wall. Finally, in order not to leave any ring of raw vaginal wall, nor a constricting circumferential scar as a result of the excision, the free margin of the raw vaginal band above is sutured to the free margin of the raw vaginal band below (Fig. 5354).

OPERATIONS FOR ABSENCE OF THE VAGINA, IN GENERAL

The vaginal canal may be congenitally absent — or may be obliterated by adhesion of its surfaces as a result of either trauma or disease. The atresia of the vagina, whether congenital or acquired, may be of a portion or of the entire vaginal tract. The majority of cases of atresia are, contrary to general supposition, acquired rather than congenital.

Congenital absence of the vagina is almost invariably accompanied by a rudimentary and non-functionating condition of the ovaries and uterus — so that congenital absence of the vagina is practically always devoid of symptoms.

Vaginal atresia, accompanied by phenomena of obstruction of menstrual flow, however, may be reasonably regarded as positive proof of the acquired type of the atresia. In other words, if the internal generative organs be rudimentary, development of the lower vagina practically never occurs. (In the single exception, where, as Veir has shown, there is prenatal closure of the hymen, this condition becomes manifest at birth or very soon after by bulging of the parts.)

The practical bearing of the above, from the surgical standpoint, is that in acquired vaginal atresia, operation for the outlet of uterine blood, from ovarian functionation, may become imperative — serving for this purpose, when once made, as well as for sexual purposes — whereas, in congenital absence of the vagina, the operative construction of an artificial vagina is always optional. In the latter case there are no symptoms due to unrelieved menstruation to be met. But there may be an almost equally imperative demand made for an artificial vagina that will substitute, as nearly as possible, the normal organ — upon the part of those who, primarily and developmentally, may be unsexed, as to progeny, nevertheless, have fully developed secondary sexual attributes and marked sexual longings.

Quite a variety of operative procedures have been devised for the construc-

tion of some approach to a normal vagina _ or, at least, a canal, or pouch sufficiently serviceable for both the exit of menstrual blood, and for sexual intercourse, in the acquired form of absent vagina _ and for a modified form of sexual living, in congenital absence of the vagina. These operative technics usually fall within one or the other of two groups _ those in which the artificial vaginal tract is lined with inturned skin or grafts _ and those in which some isolated portion of the intestinal tract is drawn into the artificially made vaginal tract. In the former type of operations, those first employed, it is usually difficult to maintain the patulousness of the tract against contraction, even by wearing artificial distenders. In the latter type, more latterly employed, the result is more likely to be permanent.

The combined intra-abdominal and perineal routes are especially indicated in atresia of the upper part of the vagina, as furnishing freer and more controllible access in safely tunneling between the bladder and rectum.

Some of the chief varieties of operation will be here considered.

OPERATIONS FOR ABSENCE OF THE VAGINA

The general bearings of this subject have just been considered _ under Operations for Absence of the Vagina, in General (v. p. 169). The chief operations, of the two main groupings there referred to, here follow. Primary union is of unusual importance.

Operation for Artificial Vagina by the Perineal Route by In-turned Flaps Furnished by the Labia Minora and Thighs _ Graves.—With the patient in the dorsal gynecologic position, a transverse incision is made a short distance below the urinary meatus. Guided by the Surgeon's left forefinger within the rectum, and a curved sound, held within the bladder by an Assistant, the Surgeon's right forefinger procedes, by blunt dissection, to tunnel out the artificial vaginal passage, between the urethra and bladder, in front, and the rectum, behind _ carefully guarding against the damaging of all these structures in front and behind _ and against entering the peritoneal cavity above. In this manner it is sought to form a vaginal canal of sufficient size as to depth and width _ with an overcalculation to provide against inevitable postoperative contraction of all measurements.

The canal thus formed is to be now provided with a mucocutaneous lining, with skin surface outward. This covering is furnished partly by the labia minora and partly by the skin of the inner aspects of the thighs. The labia minora are partly dissected from above downward, from the vaginal vestibule (Fig. 5355, **abc** and **def**) _ leaving, when turned downward, a sufficient vascular pedicle. For the purpose of gaining for these labial flaps both additional width and a raw surface for approximation to the raw vaginal canal, the sectioned margin of each of the labia minora is split, after which the inner aspect of each split lip is turned outward to correspond with the outer aspect of the same lip. Next, two flaps, of indicated size and shape, are raised from the inner aspects of the thighs, with their pedicles corresponding with the lower, lateral aspects of the vaginal opening (v. Fig. 5355, **g** and **h**).

When the vaginal tract and the covering flaps have been prepared, four double-ended sutures are carried through the vault of the vaginal canal, and their ends temporarily brought out of the vaginal wound. Then, using an inverted old-fashioned glass speculum as a form (or some other special form of support), the four flaps are brought together over this form and their margins sutured together _ the suturing being, at first, only of the outer halves of the margins (Fig. 5356). The glass form is then withdrawn by manipulation through the still open portions of the slit _ after which the four sutures

which had been placed in the vault of the vaginal canal are threaded through the vault of the newly made vaginal pouch by means of a Reverdin needle. The suturing together of the margins of the flaps is then continued to their base, thus completing the pouch, which still remains with skin and mucous surfaces outwardly protruding. This pouch is now inverted within the new vaginal canal, and pressed well upward to its vault and into snug contact with its sides. The previously placed sutures, which are to hold the vault of the new pouch to the vault of the new canal, are then tied – and, in order to everywhere hold the raw surfaces into close contact during union, strips of gauze are lightly packed against the cutaneomucous surface of the inverted pouch – but with especial care against such tight packing as might add to the danger of necrosis.

Fig. 5355.—Operation for Artificial Vagina by In-turned Flaps Furnished by the Labia Minora and Thighs – Graves – I: – Outlining the flaps – **abc** and **def**, flaps from the labia **minora**; – **g** and **h**, flaps from the inner aspects of the thighs. The labial flaps will be split from their raw **margins** nearly to their normal margins, and spread flatwise.

Finally, the wounds left by raising the four flaps are sutured.

Operation for Artificial Vagina by the Perineal Route by Detached Grafts Introduced Upon a Supporting Form – Mackenrodt (?).—An incision is carried transversely across the what would form the normal site of vaginal opening, between the urethra, and bladder in front, and the rectum, behind – after which, guided by a finger within the rectum and a sound within the urethra and bladder, an artificial passage is opened up, by combined sharp and blunt dissection, between these structures – backward and upward to the position of the cervix uteri. This passage should be made of a little more than the normal length and width, to allow for contraction. When the vaginal tract has been thus formed, one of two courses may be followed out. Either

the operation is at once proceded with and completed at the one sitting by the introduction of the grafts. Or the vaginal passage is allowed to become covered with healthy granulation tissue before the final implantation takes place – the tract being kept distended, in the mean time, by gauze packings, replaced at intervals.

When all is in readiness for the grafting of the skin covering upon either the raw or granulating bed, the grafts of which the lining for the vaginal passage is to be made are usually seccured, in ribbon-like strips, of indicated width and length, from the inner aspects of the carefully prepared thighs.

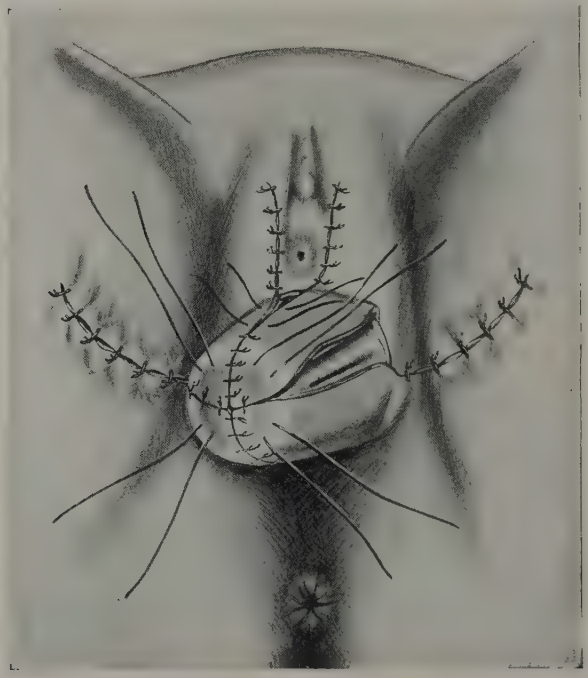


Fig. 5356.—The Same – II; – The flaps formed by the displaced labia minora, and those raised from the thighs, have been brought up over a glass form (temporarily used), and their marginal aspects sutured together – with mucocutaneous surfaces outward and raw surfaces inward. Four loose, anchoring sutures are here shown for convenience – but are, as a fact, not passed until after the withdrawal of the glass form. The margins from which the labial flaps were partly cut and the beds from which the femoral flaps were raised have been sutured.

When the glass form has been withdrawn, the loose anchoring sutures are, really, then placed by means of a Reverdin needle. After the anchoring stitches have been passed through the dome of the new vagina – and the opening through which the glass form is finally removed is sutured – the loose pouch of new vagina is inverted back into the prepared connective-tissue bed – the anchoring stitches are tied – and the cavity is loosely packed with gauze.

These are carefully arranged upon some supporting form – usually a large size of test-tube (stout enough to resist breakage). While thus supported, they may be reshaped, so that the different segments, usually three in number, will come neatly together at what will form the cervical end (possibly leaving a small circular opening corresponding with what would be a continuation of the cervical canal) and along their lateral margins. With fine chromic catgut several interrupted stitches are here and there taken for the purpose of holding the constituent parts together. The glass test-tube serves the double purpose of a form upon which to construct the vaginal pouch – and

as a carrier by means of which it may be introduced into position (Fig. 5357). The vaginal passage is then retracted by four narrow, long bladed, thin specula, especially selected – by means of which its raw or granulating walls are held

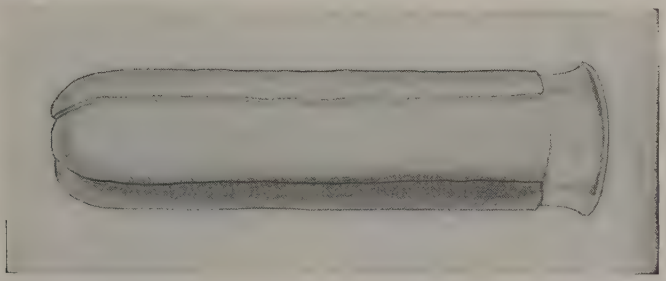


Fig. 5357.—The Same – II; – Three or four grafts, of the indicated length and width, have been raised from the inner surfaces of the thighs – and placed upon, reshapen, and united by fine catgut sutures, upon a large size of stout test-tube which will serve both as a support for the graft and a means of pressing these against the raw or granulating walls during union. Delicate sutures may unite the margins of these grafts to hold them in place.

sufficiently far apart so that the grafts will not be disturbed, upon their supporting form, in the act of introduction (Fig. 5358). If this be not done the carefully prepared vaginal pouch of sutured-together grafts may be badly

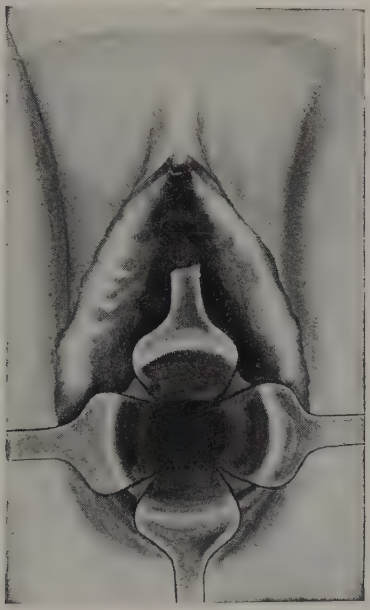


Fig. 5358.—Operation for Artificial Vagina by Detached Grafts Introduced Upon a Supporting Form – Mackenrodt(?) – I; – The plane between the urethra and bladder, in front, and the rectum, behind, has been opened up by combined sharp and blunt dissection – and its raw surfaces are being held widely apart by four special retractors, ready to receive the vaginal pouch made of grafts and held upon a support.

damaged in the act of placing it in position. The test-tube, covered by the united grafts, is allowed to remain *in situ* – serving thus not only as a form of support for the grafts, but as a presser of these grafts against the walls of the

vaginal passage during union – and should remain in position until time be given for the firm growth of the grafts to the raw or granulating walls of the new vaginal passage. Provision should be made to keep the grafts from being soaked with urine – and the vaginal outlet should be carefully protected by dressings.

The grafts are sometimes introduced upon a Cusco bivalve speculum.

Operation for Artificial Vagina by the Perineal Route by Combined In-turned Vestibular, Vestibuloperineal, and Femoral Flaps – Heppner.— The artificial vaginal passage, along the transverse line forming the boundary of the flaps **a** and **b**, Fig. 5359, between urethra and bladder, anteriorly, and rectum, posteriorly, is made in the same manner as in the methods just

Fig. 5359.—Operation for Artificial Vagina by Combined In-turned Vestibular, Vestibuloperineal, and Femoral Flaps – Heppner – I: – **a**, Flap from the obstructing vestibular diaphragm, to cover part of the anterior vaginal wall; – **b**, vestibuloperineal flap, to cover part of the posterior vaginal wall; – **c**, and **d** two long femorogluteal flaps, to be twisted upon their pedicles and brought into contact with the lateral walls of the new vagina.

described. When this has been accomplished, four flaps are planned. To the original transverse incision, two upward vertical incisions are added, to form the vestibular flap, **a** – and from the same incisions two downward vertical incisions form the vestibuloperineal flap, **b**. Both of these flaps are short, at best, but are made as long as the anatomy of the parts allow. The upper will cover as much of the roof, and the lower, as much of the floor of the new vaginal tract as their length will allow. Two long and wide femoral or femorogluteal flaps, somewhat pear shaped (that is, larger) at their ends, are next raised, either from the inner sides of the thighs alone, or combinedly from the skin of the inner aspect of the thighs and of the buttocks. These long flaps are displaced inward, twisted upon their pedicles, and applied to the lateral walls of the vagina (Fig. 5360).

As in the preceding methods, the flaps may be at once applied to the raw surfaces in the single-step operation _ or the flaps may be raised and applied after the vaginal passage, made as the first step, has granulated. The long

Fig. 5360.—The Same _ II; _ The position of the in-turned flaps is shown.

flaps should not be cut sufficiently bell shaped to jeopardize the circulation in their ends. All flaps are held in close, but not tight contact with the new vaginal walls during healing, by snug gauze packing.

Fig. 5361.—Combined Intra-abdominal, Intraperitoneal, and Perineal Operation for Absence of Vagina _ Vineberg _ I; _ Sectional view of pelvic organs: _ a, Line along which uterus is temporarily separated from bladder, following abdominal section; _ b, route of tunneling channel for new vagina between bladder and rectum.

Operation for Artificial Vagina by the Combined Intra-abdominal, Intraperitoneal, and Perineal Routes _ Vineberg.—The especial feature of operating by the combined routes is that one is not only able to learn the

structural condition of the parts as a guide to the following steps, but that the intra-abdominal hand is able to safely guide the perineal manipulations during their performance from without. The abdomen is entered through a low median abdominal section, with the patient in the elevated gynecologic position and the bladder emptied. Following down the interval between bladder and uterus these two structures are limitedly separated at their junction in the median line (Fig. 5361, **a**) _ and through this opening the fingers may be brought into contact with the normal or rudimentary cervix of the uterus _ and sometimes an upper vaginal canal which is patulous. Thus in command of the upper end of the tract through which the new vaginal passage is to be made, and having estimated the extent of tissue intervening between the urethra and bladder, in front, and the rectum, behind, one may proceed with a greater sense of security in making a passage, by combined sharp and blunt dissection, from the site of the vestibule to the cervix (v. Fig. 5361, **b**). Provision for the lining of the canal is made by mobilizing flaps in the vicinity of the vestibule and twisting and gliding them into the

Fig. 5362.—The Same _ II: _ **a**, Sutures restoring the vesico-uterine relations; _ **e**, circular line of interrupted sutures uniting margins of rudimentary vaginal culdesac above to margins of undercut perineal flaps drawn up from below (where this is possible).

new vaginal passage, where they are anchored as high up this tract as they will reach, as shown in Fig. 5362, **e**. Or one of the already mentioned methods of covering the tract may be adopted, with the increased ease of being able to work from both ends. Finally, the uterovesical junction is re-established by suture _ and the abdomen closed.

Operation for Artificial Vagina by Combined Intra-abdominal, Extraperitoneal, and Perineal Routes _ Carl Beck.—The abdominal wall is incised by a transverse suprapubic incision _ just as in transverse suprapubic cystotomy. Then, keeping outside of the peritoneal cavity, the peritoneum is separated, by blunt dissection, from the posterior wall of the bladder _ keeping close to the bladder down to the retrovesical space. Working from the normal site of the vestibule, a counteropening is there made, and a vaginal passage tunneled thence, between urethra and bladder, in front, and rectum, behind, until it reaches the retrovesical space already opened up from the suprapubic incision. Two full, long skin-flaps are next raised from the inner sides of the thighs with their bases at the labia. A pair of long, curved forceps is then introduced through the suprapubic wound, and carried down to the

entrance of the perineal wound – where each flap is seized, in turn, and drawn through the newly made vaginal passage, until its end reaches the usual

Fig. 5363.—Operation for Artificial Vagina by the Combined Routes by Transplantation of a Pedicled Loop of the Ileum – Baldwin – I; – The transverse incision, over the normal site of the vagina, opening up the way for tunneling the new vaginal passage through the perineal body.

height of the vaginal fornices, and is then sutured into position at its upper end. The suprapubic wound is then closed. A light gauze packing is placed

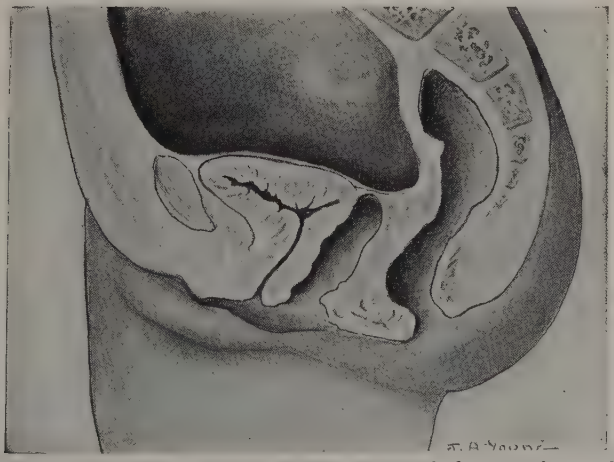


Fig. 5364.—The Same – II; – The route along which the new vaginal passage is tunneled through the perineal body.

within the new vagina, so as to hold the flaps in contact with the raw walls of the vaginal passage.

Operation for Artificial Vagina by the Combined Routes by Transplantation of a Pedicled Loop of the Ileum _ Baldwin.—This operative measure covers a considerable field _ involving the thorough preparation of the patient for both intestinal resection and for an extensive perineal procedure. With the patient in the lithotomy position, and the bladder emptied, a transverse incision is made, crossing the normal site of the vaginal opening (Fig. 5363) _ guided by the urinary meatus and the anal orifice. Guided by a finger in the rectum and a sound in the bladder, and by combined sharp and blunt dissection, a new vaginal passage is made from the perineal floor to the peritoneum, and between the urethra and bladder, in front, and the

Fig. 5365.—The Same _ III; _ The partially excised loop of ileum still retaining its blood-supply through its corresponding portion of mesentery. A silk tractor has been carried through the mesentery of the partly separated segment. All four ends of the bowel have been closed by purse-string suture reinforced by Lembert's. The ends of the main intestinal tract have been closed and the continuity of the tract re-established by lateral entero-anastomosis.

rectum, behind (Fig. 5364) _ with every care that no adjacent organ be injured nor the peritoneum be prematurely opened. A long, slightly curved clamp forceps is carried through this passage until its tip rests in contact with the peritoneum ready for later use _ and around this gauze is moderately packed. A dressing is temporarily thrown over the perineal wound.

With the patient now lowered into the horizontal decubitus or, better, placed in the Trendelenburg position, median abdominal section is performed. After "milking" to each side the intestinal contents, a 25 cm. (10 inches) segment of the ileum is excised, maintaining its continuity with the mesentery (Fig. 5365) _ the center of the excised segment being about 43 cm. (17 inches) from the cecum, where the mesentery is unusually long. The isolated segment

should be amply long to be easily drawn into the new vaginal passage. The four ends of the intestine are closed by purse-string suture, reinforced by Lembert's. To restore the intestinal circuit the antimesenteric aspects of the divided ends of the main tract are usually laterally anastomosed. (Baldwin restored the intestinal canal by an end-to-end Murphy button anastomosis. The mesentery of the isolated loop of ileum is carefully preserved, its nourishment being dependent thereon. A silk tractor ligature is passed through the center of the isolated loop of the ileum immediately next the intestine.

The gauze which has been packed into the new vaginal passage is now removed _ and a long pair of dressing forceps, if not already left in position, is carried through this passage, up to the peritoneum, against which the end of the forceps is carefully pushed. The peritoneum is then incised, from within the abdomen, over the slightly separated blades of the forceps, carefully avoiding both bladder and rectum. The blades of the forceps are carried further through the peritoneal slit, and enlarge it, by being opened sufficiently to make way for the loop of ileum to be drawn through by means of the tractor

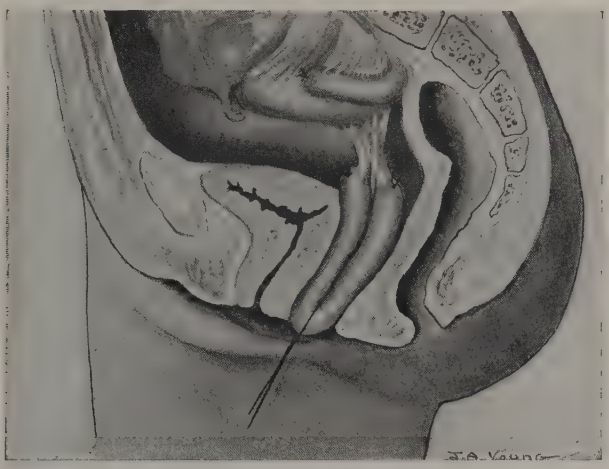


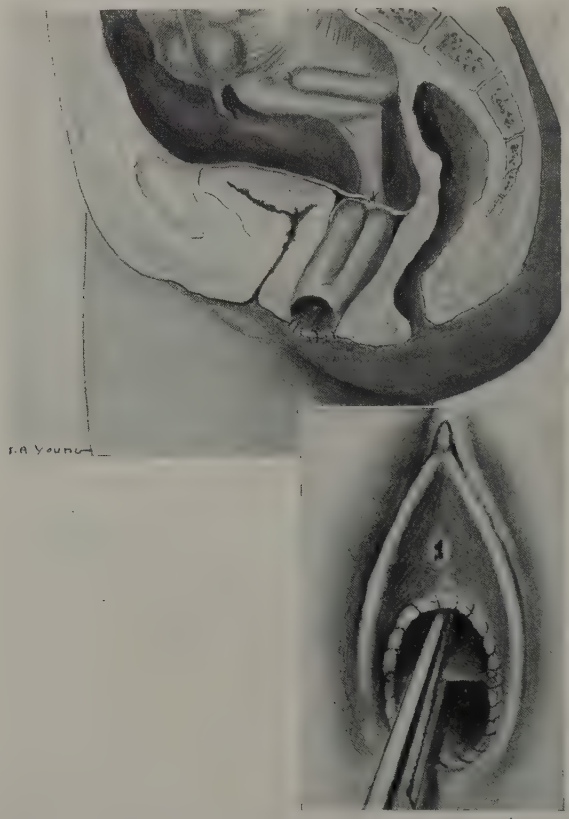
Fig. 5366.—The Same _ V; _ Drawing the semidetached loop of ileum through the peritoneal opening and down through the new vaginal passage.

loop, which is now seized by the forceps _ the middle of the loop being drawn well into and beyond the perineal outlet of the new vaginal canal (Fig. 5366). The peritoneum is now carefully sutured with fine catgut around the two closed ends of the intestinal segment and its mesentery _ especially avoiding too tight constriction of the vessels of the mesentery (Fig. 5367). The abdominal wound is closed.

The patient is returned to the lithotomy position. The loop of intestine, protruding from the perineal opening of the new vaginal canal, is lightly clamped near the antimesenteric border on each side of the tractor loop, which is now withdrawn. The antimesenteric aspect of the middle of the loop is now divided with scissors (the section not passing entirely through the loop). The two intestinal limbs are then given a half-twist, so that the left limb is anterior (in front) and the right limb, posterior (behind) _ unless they already so lie _ thus giving a "two story," or double-tube vagina, in the vertical axis. The margins of the open end of the loop are then sutured to the margins of the perineal opening. The double intestinal limbs are cleansed of their contents _

and their walls are pressed into contact with the walls of the new passage by opening the blades of long forceps or clamps within them.

The serous walls of the intestinal limbs unite to the raw walls of the new passage _ and the now parallel limbs of the loop unite to each other. After the patient is entirely well, generally several weeks after the operation, the septum between the two limbs of the intestinal loop formed by the opposite wall of each limb is divided _ the division usually being accomplished in one of two ways. Either the septum may be divided as is the "spur" following colostomy _ by the pressure of a long-bladed clamp (Fig. 5368, b) compress-



Figs. 5367 and 5368.—The Same _ IV and VI: _ a, The closure of the peritoneal opening around the ends of the bowel loop and its mesentery. The opening of the apex of the loop and the suturing of the margins of the intestinal opening to the margins of the peritoneal opening; b, subsequent cutting through the double intestinal wall by clamp, thereby destroying the "spur" or double wall between the two barrels of intestine.

ing the middle of the adherent walls for three to five days (the patient being under an opiate if in pain). Or two parallel clamps may compress the septum, which is then at once divided between them _ the clamps being left *in situ* for a day, after which there is no danger of bleeding.

The especial feature of the intestinal transplant method of operating is that it supplies a vagina with mucous lining _ and that the frequency of postoperative contraction, following most of the non-intestinal types of operation, is much lessened or avoided. Graves states that there will always be sufficient length of mesentry to enable the isolated loop of ileum to make

the requisite reach – and that the same is true of utilizing the sigmoid colon, though, in the latter, mortality is increased, as is the case, independently, in dealing with the large intestine as compared with the small.

It is to be remembered, as cited by Graves, that the mucosa of the new vagina goes on secreting (the secretion sometimes being irritating) – and that it is also an absorbing surface, subjecting the patient to the possibility of being poisoned if poisonous fluids be brought into contact with it, as in vaginal douching with bichlorid of mercury and the like.

Operation for Artificial Vagina by the Perineal Route by the Transplantation of the Isolated Lower End of the Rectum – Schubert.—With the patient in the right Sims' position, the hymen is excised, the dissection

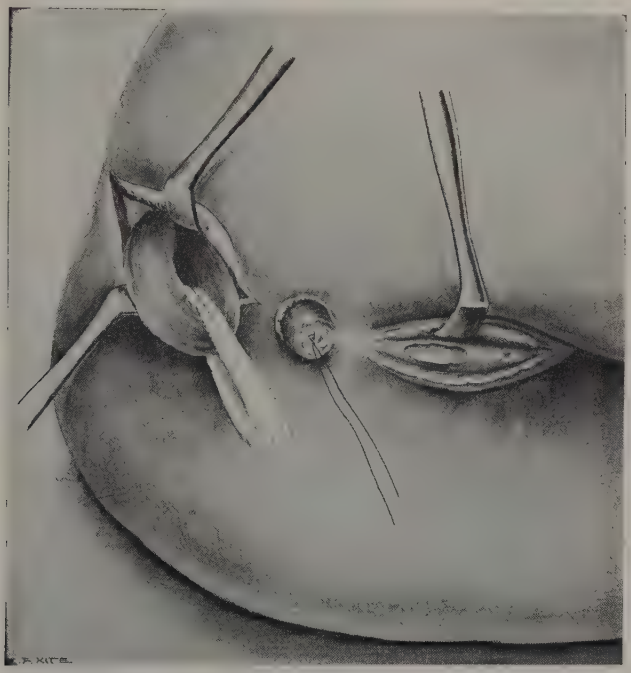


Fig. 5369.—Operation for Artificial Vagina by the Perineal Route by the Transplantation of the Isolated Lower End of the Rectum – Schubert – I; – The denuded hymenal site of the vaginal introitus – the mobilized and drawn-down distal end of the rectum, protruding through the anal orifice, temporarily closed by suture – and a loop of rectum, brought down in a gauze loop, after excision of the coccyx – are seen in order from before backward.

being superficial – leaving a denuded area in the region of the normal vaginal outlet (Fig. 5369). Having moderately dilated the sphincter ani, a circular incision is carried around the anus at the junction of skin and mucosa – and, through this, the rectum is carefully freed from the sphincter up to a height of about 3 cm. ($1\frac{1}{4}$ inch) – avoiding damage to the sphincter. The freed end of the rectum is temporarily closed by suture, the ends of which are left long, for convenience of manipulation.

Starting at a point in the median line 5 cm. (2 inches) above the anus, a 10 cm. (4 inch) incision, extending upward, is made over the coccyx and sacrococcygeal junction, exposing the joint – and, through this, the coccyx is excised (Fig. 5370). Access is thus gotten to the postrectal pelvic fascia – which is incised vertically down to the rectum. By blunt dissection the

rectum is sufficiently freed in its bed to enable it to be drawn out into the wound just made, which is made possible through the excision of the coccyx. As soon as a loop of the rectum can be delivered, a double ligature of stout silk is passed around it, by means of forceps, through a passage made by blunt dissection of the tissues. The ends of the ligature are separated, in pairs, to either side (seeing that the ligatures do not cross) – using them as mechanical saws, in opposite directions, until the rectum is sufficiently cleared of connective-tissue attachments to enable a stout, cord-like strip of gauze to be carried through the opening thus made – which, because of its softness and size, will not damage the rectum while it is being drawn down by its means. The mobilizing of the rectum is an essential part of the technic. A twofold calculation must be made – a sufficient length of rectum for the

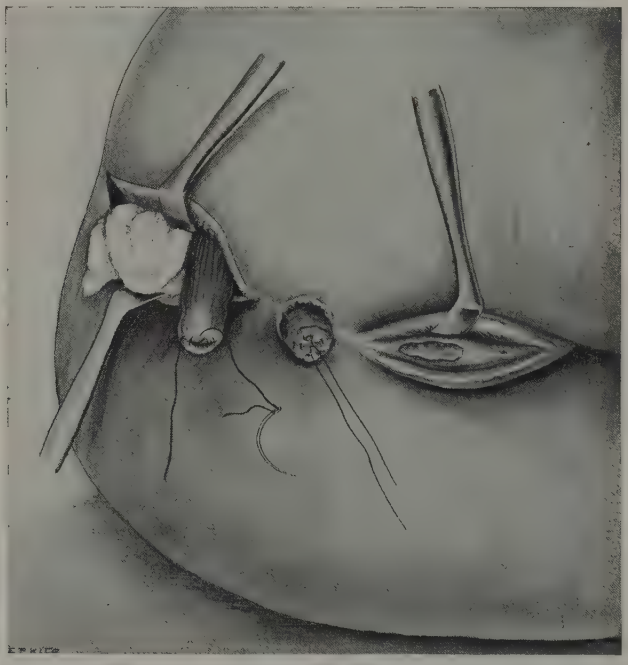


Fig. 5370.—The Same – II; – Surface view of the involved parts from before backward – denuded vaginal introitus – mobilized anal or distal end of rectum – permanently sutured proximal end of isolated segment of bowel – gauze surrounded distal and divided end of the main intestine.

artificial vagina (about 10 cm. or 4 inches) – and a sufficient freeing of the rectum even above the level of its division to enable the divided end of the proximal segment to be brought down to the anal orifice. The peritoneum is carefully pushed upward as the rectum is freed and drawn downward – exercising care that the peritoneal cavity be nowhere opened. The rectum is now clamped just above the level of intended division, and then transversely divided just below the clamp (or doubly clamped and divided between). The upper end of the distal segment of rectum (which will form the vault of the new vagina) is at once permanently closed by a double tier of sutures. This upper closed end of the isolated rectal segment, forming the dome of the vagina, is now anchored by chromic catgut suture as high up as possible to the sacrospinal ligament. Between the hymenal denudation and this upper

limit of attachment of the new vagina the passage is opened up by blunt dissection to an extent capable of taking two fingers. This tunneled passage

Fig. 5371.—The Same _ III; _ Sectional view of the involved parts from before backward _ forceps, passed through the denuded vaginal introitus, for drawing the isolated segment of bowel into its new vaginal site _ distal end of the isolated bowel segment, drawn by temporary ligature of its end _ permanently closed proximal end of isolated segment still protruding through the site through which the loop of rectum has been drawn down _ and terminal end of the divided main intestine.

also communicates with the lower end of the rectum, mobilized in the early stage of the operation _ and, through it, curved forceps are carried from the

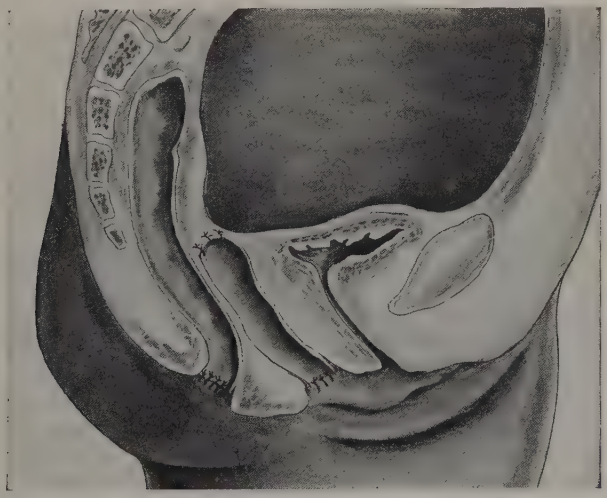


Fig. 5372.—The Same _ V; _ The upper closed end of the lower segment of the rectum has been anchored, by suture, to the sacrospinal ligament _ and its anal end brought forward through the tunneled perineal passage, making its exit at the hymenal opening, where its margins are sutured to those of the surrounding skin. The lower end of the main portion of the rectum has been anchored within the sphincteric opening of the anal orifice.

hymenal opening to the anal orifice, where the lower end of the rectum is seized and drawn forward until its end (the former anal orifice) is protruded

out through the hymenal opening – where its margins, after removal of the temporary suture, are sutured to those of the surrounding skin (Fig. 5371).

Finally, the divided end of the main portion of the rectum, which has usually been temporarily sutured, is brought down through the sphincter muscle, into the anal orifice, and there, after freeing the temporary sutures, anchored by buried and superficial sutures – its margins being accurately sutured to the skin (Fig. 5372). A temporary drain is inserted into the wound over the bed of the coccyx.

It will thus be seen that the new vagina has been constructed out of the entirely separated lower end of the rectum – which segment of 10 cm. (4 inches) has been bodily transplanted – and now extends from the hymenal opening to the sacrospinal ligament.

As compared with the Baldwin technic, last considered, the present method, as an extraperitoneal procedure, has a lower mortality – and the secretions from the lower rectum are less irritating than those from the ileum.

OPERATIONS FOR LACERATION AND RELAXATION OF THE VAGINA AND PERINEAL BODY, IN GENERAL

Mechanism of Vagino-perineo-rectal Laceration.—The chief supporting structure of the resistant, elastic bridgework, termed the "perineal body," is formed chiefly by the union of the two sling-like levator ani muscles which constitute the pelvic diaphragm.

The surgical anatomy of the perineal body has been already alluded to at p. 155.

The levator ani muscles are fan shaped, with their bases, above, originating from the posterior aspect of the body of the os pubis, from the parietal pelvic fascia (from the "white line," or immediately above it), and from the spine of the ischium. Passing downward, the median and posterior fibers are inserted, sling fashion, into the central tendinous point of the perineum, to the external sphincter surrounding the anus (blending with the external longitudinal fibers of the rectum), to the anococcygeal raphé posterior to the anus, and to the sides of the lower sacral and coccygeal vertebræ. The anterior halves of the levator ani muscles come together in the median line along a central raphé, the anterior end of which is at the entrance of the vagina the posterior end merging with the sphincter ani muscle. The puborectales are the two lateral aspects of the levators which are inserted into the central tendinous point of the perineum, and into the sides of the rectum, supporting and drawing upward and forward the portion of the rectum posterior to the vaginal wall. The two transverse perineal muscles are also attached to the central tendinous point, internally, and to the ischial tuberosities, externally.

It is difficult to determine the details of insertion of the anterior fibers of the levator muscles with reference, especially, to the vagina, the matter seeming to be indeterminate among Anatomists. Neither Cunningham nor Morris refer to the levator muscles as having either relationship or connection with the vagina. Gray states: "Luscha and others believe that these anterior fibers descend among the longitudinal fibers of the rectum. It is certain that the most anterior fibers of the pubococcygeus (the anterior portion of the levator ani) muscle pass to the central tendinous point of the perineum. They pass 'backward and downward on the side of the prostate, and in some cases on the side of the urethra immediately it emerges from the prostate.' These anterior fibers in the female descend upon the side of the vagina." Piersol writes: "The fibers from the most anterior portion of the origin (of the levator ani) pass almost directly backward and downward to reach the sides of the rectum, and between them and the corresponding fibers of the muscle of the

opposite side is a space occupied, in the male, by the lower part of the prostate gland, and, in the female, by the base of the bladder and lower part of the vagina, the fascia endopelvina in this region coming into contact with the upper surface of the superior layer of the triangular ligament of the perineum." It will be thus seen that none of these Anatomies state that the levator muscles are inserted into the vagina – and that only two of the four state that they even have relationship with the vagina. The inference, from the writings and picturings of some of the best Gynecologies, is that the levators actually merge with and are connected to the sides of the vagina – and that seems to be the impression which most usually prevails. The matter is of

Fig. 5373.—Diagrammatic View of Vaginoperineal Lacerations – seen as though a coronal section were made within the plane of the vestibule of the vagina – showing a median and two lateral lacerations – the latter being in the vaginal sulci and of unequal depth. The characteristic H-shaped apposition of the vaginal walls is given.

practical importance from the standpoint of the desirability of knowing, accurately, what structures one deals with in the various forms of laceration of the vagina. It would appear, as seems more represented by Gynecologists than Anatomists, that some of the more anterior fibers of the levator ani muscles are actually inserted into the sides of the lower part of the vagina in the same sense that they are inserted into and actually merge with the longitudinal muscle-fibers of the rectum.

In marked forms of perineal laceration (Fig. 5373) which occur in childbearing the traumatism which results is, as described by Graves – first, that there is cleavage of the central raphé, which may be but slight, or may

extend to the sphincter ani, allowing the transverse perineal muscles and the inner aspects of the levatores ani to retract toward the pubic rami. And, second, that the anterior fibers of the puborectales, of the levators, are torn (usually unequally upon the two sides) – thereby lessening the support of the rectum and resulting in a depression, or sulcus upon each lateral aspect of the rectum, which admits of the forward protrusion of the rectum through the posterior vaginal wall (rectocele). The tear may even pass through the anus and into the rectum, involving fecal incontinence.

As a result of this traumatism there is a gaping and greater patulousness of the vaginal outlet, caused by the outward and upward retraction of the severed sling-like muscle structures toward the pubes. The perineal body (Fig. 5374) disappears in some degree or entirely. The rectum, whose lateral supports are damaged or lost, tends to bulge toward the vaginal outlet

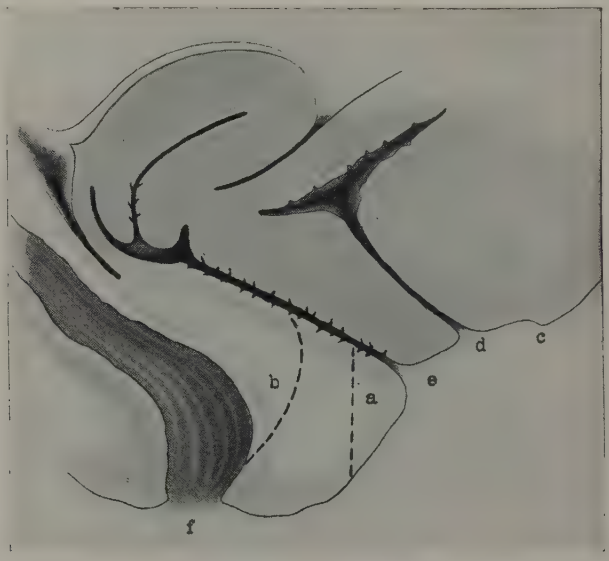


Fig. 5374.—Sectional View of Vaginoperineal Lacerations: – a, Illustrating a moderate degree of tear through a portion of the vaginoperineal outlet; – b, a marked degree of laceration of the vagino-perineo-rectal tissues, the tear extending from high up in the floor of the vagina, through the entire base of the perineal wedge, and into the rectum; – c, clitoris; – d, meatus urinarius; – e, vaginal outlet; – f, rectum.

(the usually prominent anterior margins of the puborectales being but little or at all determinable by palpation) – and under lessened perineal resistance the intra-abdominal pressure tends to increase toward the perineal outlet, the bulge of those structures whose supports have been damaged.

Along with loss of perineal support may come uterine prolapse, rectoceel, and cystocele, as links of a single change, in various forms and degrees of combination – together with their individual and combined trains of symptoms.

The need for vaginoperineal operation may be present without demonstrable external evidences of laceration, and be pressing. Submucous laceration may take place without their being mucus or cutaneous tear to show. And as Crossen reasonably states, a considerable degree of submucous laceration may take place which could have been neither determined, located, nor repaired at the time of childbirth – and for which, therefore, no one is to blame. Again, vaginoperineal relaxation may result from imperfect involution follow-

ing labor, or from uterine prolapse independently of labor — and in neither case be accompanied by either outward and visible or inward and invisible rupture.

Principles of Operative Repair of Vaginoperineal Laceration and Relaxation.—The fundamental principle involved in the operation for the correction of vaginoperineal laceration, and its consequences, is the repair of the damage done to the structures by laceration, and the restoration of them to, as nearly as possible, their normal conditions and relations. To accomplish this the involved parts, especially the ruptured muscle tissues, must be freely exposed in the field, and accurately brought into apposition by suture. No simple suturing of merely superficial structures will suffice where deeper structures have been torn — and where the crux of the situation lies in the loss of support due to the traumatic defects in the more deeply lying parts. The levator muscles torn in the vaginal sulci, the tear in the central raphé, the separated transverse perineal muscles, the ruptured junction of the levatores, the damaged sphincter of the anus, and the rectum, if torn — must all be repaired by precise apposition by suture — and the vaginal mucosa and perineal skin be united over them all.

The range of operative technic is from exceedingly simple procedures in minor grades of superficial, non-muscle lacerating tears, where almost any reasonable method of operation succeeds — to very much more difficult procedures requiring considerable experience and deft technic, where vagino-perineo-rectal rupture may be complicated by rectocele, cystocele, uterine prolapse, and general relaxation.

The degree of prolapse which may accompany the various types of rupture will play a large rôle in the considerations for operation. The extremes in this direction are seen where, on the one hand, relaxation following perfect technical repair and perfect healing may call for operation — while an even unrepaired laceration may not actually require operation if the contracted scar tissue affords good support and no relaxation be present.

The salient features of operative repair of "relaxation of the pelvic floor" (which designation he prefers to laceration) are briefly stated by Crossen: — the taking up of the slack, so as to shorten and re-establish the integrity of the pelvic sling — and the restoring of the perineal body in order to bring forward the weak site in the pelvic floor (the lost perineal body) away from the line of direct pressure.

The anatomic structures whose repair is indicated in extensive lacerations are given by Hirst as follows: — (*a*) The lacerated levator ani — the rupture of which generally commencing just beyond its origin at the descending ramus of the pubis and running thence downward and inward toward its inferior margin, but not extending to the median line — the lower aspect of the muscle being the part torn in partial injuries; — (*b*) The medially separated and laterally retracted transverse perineal muscles which draw outward in their sheaths toward the ischial tuberosities; — (*c*) The transverse perineal muscles at their separation from the base of the perineal body on one side or the other, or both; — (*d*) The triangular or rhomboidal laceration of the pelvic fascia, in the median line, superficial to the levatores and the deep transverse muscles — the apex of the triangle being above and base below, with a second triangular extension in the direction of the posterior column of the vagina; — (*e*) The medially torn perineal body, dividing the union of the bulbocavernosus muscles and superficial transverse perineal muscles; — (*f*) The laceration of Colles' fascia (the deep layer of the superficial pelvic fascia).

Moderate degrees of rectocele, cystocele, and uterine prolapse coexisting with vaginoperineal lacerations are apt to be cured by the success of the

perineal operation. Marked degrees of these conditions, however, may require additional operations.

Varieties of Vaginoperineal Operations as to Degree and Time.—As to Degree:—Laceration of the vaginal mucosa alone, without involvement of deeper structures, sometimes occurs—but usually, to some extent at least, the tear extends into the connective-tissue plane, if not further. On the other hand, there may be submucous or subcutaneous tear of the connective tissue or of the muscles, without laceration of either the skin or mucosa. Partial laceration is usually applied to tears which stop short of involving the rectum—complete laceration, to those which pass into and through the anus and rectal wall.

As to Time:—Immediate operations are those performed at once following labor—or, at most, within twenty-four hours. Unless contraindicated by the patient's condition, or some unusual circumstance, vaginoperineal tears should, in the estimate of most Surgeons, be performed immediately after delivery—or as soon, within the twenty-four hours, as efficient aid, if required, can be summoned.

Intermediate operations are performed during the granulation period, or within a period dating from the end of the first twenty-four hours to the end of the first two weeks. Repair is usually accomplished without cutting—the parts being simply cleansed, disinfected, sometimes cureted, and then brought together by sutures—in very much the same manner as described for immediate operations (v. Index). This period is sometimes, though exceptionally, chosen by preference. Hirst writes (in 1919), under the head of "A Rational Perineorrhaphy:—My practice for more than fifteen years in private, hospital, and dispensary patients has been to wait at least five days before attempting a repair of the genital canal. Even if it were practicable to repair the pelvic floor immediately with uniform success (which it is not), ample clinical experience in many clinics has demonstrated that the cervix and anterior wall cannot be repaired immediately."

Secondary operations are those performed at any period after healing—usually after a considerable lapse of time.

Preparatory Treatment for Vaginoperineal Operations.—This has been largely covered under Operations Upon the Female External Generative Organs (v. p. 124).

The bowels should be well emptied in advance and by enema immediately before operation.

Partial shaving of the external parts usually suffices. Thorough preliminary scrubbing and disinfecting of these regions should be carried out.

The vagina should be cleansed by antiseptic douching.

These preparations especially apply to intermediate and secondary operations—and must, of course, be modified according to circumstances in immediate operations.

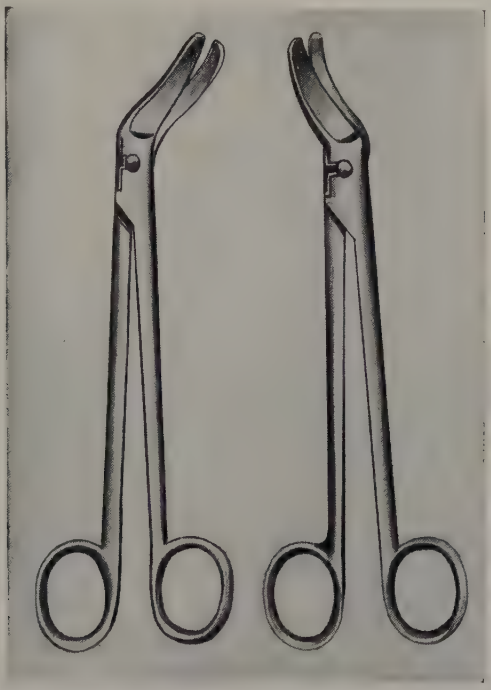
In immediate operations the parts are often so benumbed by the distention of the structures through, probably, the stretching of the nerve supply, that rather extensive operations may frequently be performed without even analgesia. In other instances analgesiating infiltration is indicated, and sometimes anesthesia. In intermediate operations analgesia will often suffice—though anesthesia may be required. In secondary operations anesthesia is nearly always used.

After-treatment.—The knees were formerly bound, following vaginoperineal operations, but now rarely so—provided patients be careful in their movements. There is no doubt, however, in the more extensive forms of vagino-perineo-rectal tears that the wound is safer with the knees confined.

If there be the slightest doubt as to the wisdom of this, let any Surgeon, lying upon his back, place his finger-tips upon the middle of his own perineum, and then move his knees up and down and from side to side _ to convince himself as to how much the perineum is thereby moved.

Patients should be allowed to voluntarily urinate _ the parts being immediately afterward douched with normal saline solution, poured upon them from a wide-mouthed pitcher, without digitally putting the lips of the wound under tension. Only if it be distinctly demonstrated, after resorting to every available device, that voluntary urination be impossible, should the catheter be used _ and then only in the hands of an exceptional Nurse.

The bowels are kept temporarily constipated where the sutured tear extends into the rectum _ otherwise the bowels can be moved on the third day.



Figs. 5375 and 5376.—Emmet's Right and Left Curved Uterine Scissors.

The sutures are generally removed on from the eighth to tenth days.

The patient's interests are best conserved by a two-week stay in bed. In turning, the knees should be approximated.

Choice of Operative Technic.—The principles of the best operations are, practically, the same _ though the methods of making and closing the wounds may differ in the different procedures.

The two most frequently employed types of technic are the Emmett "butterfly" operation _ and the Tait flap-splitting operation _ or modifications of these. The description of the most important of these will be given.

Manipulation of the vaginal walls and perineum during operation is best accomplished by special types of tenaculum forceps, "shepherd hooks," and the like (as shown in the following operations) _ though sometimes nar-

row types of retractors can be used for holding back the anterior wall and the upper parts of the lateral walls when this, exceptionally, is necessary.

It is well to have on hand scissors of several forms, curves, and angles (Figs. 5375–5378).

Fig. 5377.—Hebb's Curved Scissors.

If a moderate degree of rectocele or cystocele should be found present as a complicating addition to simple laceration or relaxation, or both compined, the rectocele or the cystocele will probably be cured by the operation for the vaginoperineal laceration or vagino-perineo-rectal laceration itself _

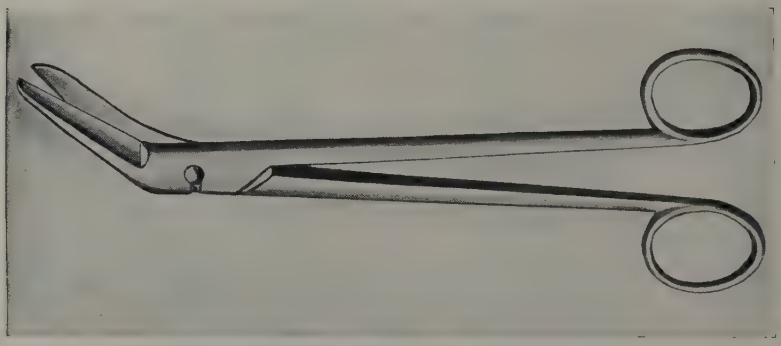


Fig. 5378.—Scanzoni's Angular Uterine Scissors.

but whenever either rectocele or cystocele coexist in a marked degree, it is usually necessary to resort to one of the special operations for their relief (v. Index) _ in addition to the repair of the lacerated or weakened vaginal floor, perineum, or rectal wall.

OPERATION FOR RECENT VAGINOPERINEAL OR VAGINO-PERINEO-RECTAL LACERATION

See Operations Upon the Pregnant and Puerperal Uterus and Extra-uterine Pregnancy (v. Index) _ where the repair of the laceration immediately after its occurrence will be found described.

Operation performed immediately after the child-bearing at which the laceration occurs, while the wound is still open and no permanent retraction of the torn muscles has taken place, is a simpler procedure than it is after healing and retraction have occurred _ when a new wound must be made and retracted tissues found and repaired _ and where, after delay, the results of

relaxation may also have to be counteracted sometimes by an additional operation.

The operations to be here considered are for the repair of laceration or relaxation, or of both combined, and their results, which have occurredat some time more or less remotely antedating.

INTERMEDIATE OPERATION FOR VAGINOPERINEAL OR VAGINO-PERINEO-RECTAL LACERATION

Intermediate operation may be performed at any period during granulation of the wound _ that is, from five or six days following the rupture of the parts up to two or three weeks. It is rarely selected as the period of choice. While, however, the detritus in and outflow from the parts during this time of nature's efforts to repair the damage are not ideally favorable to operative undertaking, yet, on the other hand, the parts are often well supplied with vascularization and healthy granulation _ and union will usually follow well prepared, carefully conducted effort at this period.

The procedure at this time more nearly resembles that employed at the recent, or immediate operation, than it does that of the secondary operation.

The especial feature, after the thorough preparing and cleaning of the parts, and either the direct application of 4 per cent. cocain solution pressed against the granulating surface, or the injection of novocain solution beneath the site _ is to curet away the granulating tissue _ sometimes using scissors and forceps to accomplish this in more resisting areas. No pockets or crevices should be left. When the surfaces are all thus prepared, and bleeding has been controlled by gauze pressure, the surfaces are brought together by suture in exactly the same manner as employed in dealing with fresh lacerations (v. Index). It may be indicated to use a few buried chromic catgut stitches as well as marginal tissues _ and these latter should take a particularly good hold.

OPERATION FOR VAGINOPERINEAL LACERATION AND RELAXATION

BY TAIT'S FLAP-SPLITTING METHOD

Description.—In the form of laceration under consideration the tear has taken place through the floor of the vagina, into and through some of the perineal structures _ but not into the rectum. The tear may be median, lateral, bilateral, or irregular, or in various combinations of these.

The general features of the present operation, chiefly due to the work of Tait, are the following: _ (*a*) The transverse splitting of the perineal body, in the curved plane between the floor of the vagina, whose convexity, under distention, is downward, and the wall of the rectum, whose convexity, under distention, is forward _ the avoidance of the buttonholing of either or both, of which structures having, therefore, to be especially guarded against; _ (*b*) The reconstruction, by suture, in the median line of the pelvic floor, especially of the torn and retracted muscular structures; _ (*c*) The closure by suture in the median line of both the vaginal and perineal mucocutaneous surfaces (the excess of vaginal flap usually being excised to make this possible). The geneal features of the procedure to be here described are largely those of the Tait flap-splitting method _ many minor variations from which have been introduced. A characteristic of the flap-splitting operations is that the transverse wound is sutured vertically.

Preparation.—The intestinal tract should be well moved the day in advance _ and the lower bowel thoroughly cleansed by enema an hour or two before the operation. Owing to the proximity of the anus to the field of

operation these measures are of more than ordinary importance _ as nothing is more disagreeable to the Operator, nor adverse to the wound, than to have a fecal flow during the relaxation of anesthesia. The external parts are generally entirely shaven _ though sometimes only the lower parts of the vulva, perineum and thighs are shaven. The vagina is douched with antiseptic solution for one or more days in advance of operation, as indicated, coming to the table in a sterile dressing. On the table the vagina usually receives a final scrubbing up and antiseptic douching, followed by a saline douche. Some Surgeons swab the vagina and perineum with a half strength tincture of iodin solution as the last preparatory step.

Position.—The horizontal dorsal gynecologic posture, with the buttocks resting upon a Kelly pad, and projecting over the end of the table _ the legs

Fig. 5379.—Operation for Vaginoperineal Laceration (Incomplete Laceration) by Flap-splitting _ I; _ The line of section, just within the mucocutaneous vaginoperineal junction, outlining the U-shaped flap to be raised _ the upper limbs of the incision beginning and ending just below the openings of the ducts of the bartholinian glands.

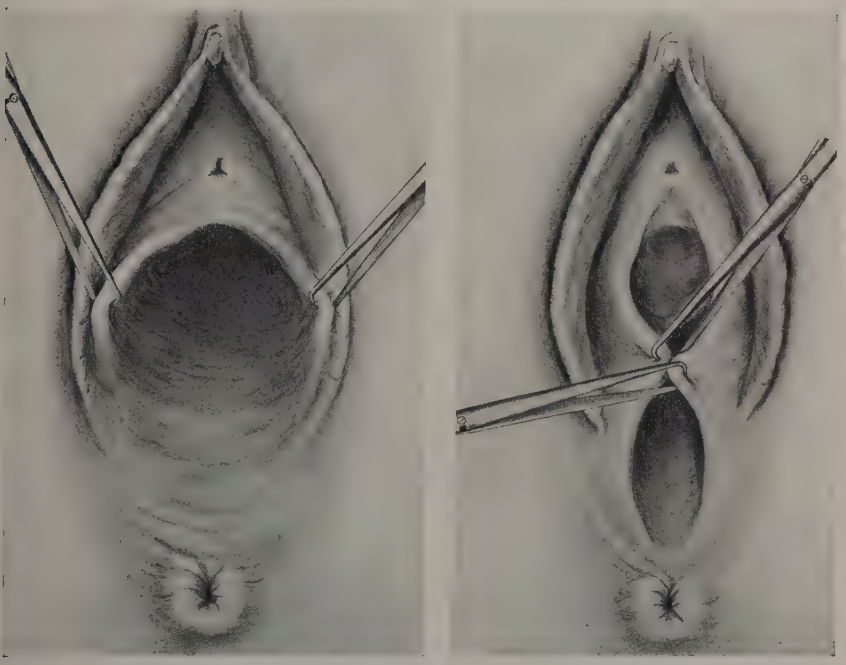
in sterile stocking-drawers, supported in stirrups _ and the immediate field of operation being shielded, except for the vulvoperineal operation site, by some special form of sterile protector, or by sterile towels held by safety-pins.

Landmarks.—The nature and degree of tear, together with the amount of relaxation, will have been determined in advance of the operation _ and will be emphasized under Anesthesia. Useful landmarks in estimating the original floor of the vaginal outlet are the carunculæ myrtiformes, on each side of the outlet of the lower part of the vagina, which mark the shriveled remains of the hymen. It is also of practical importance to recognize the position of the openings of the ducts of the bartholinian glands, just outside of the remains of the hymen, in the groove, on each side, between the caruncula myrtiformis and the labium minus _ for if these openings were included in

the incision and its suturing, a sensitive scar and cyst formation are apt to follow. With all of these data in mind, the line of incision is planned accordingly — so as to restore, as nearly as possible, the normal vaginoperineal body and its supports, the perineal face, and the vaginal floor.

Analgesia — Anesthesia.—Analgesia infiltration is sometimes employed — anesthesia, however, being generally used.

Incision.—This is a curvilinear or U-shaped line, with downward convexity, through which the transverse splitting through the remains of the perineum, between vagina and rectum, is begun — and is generally made with scissors. Its upper limits do not extend high enough to involve the openings of the bartholinian ducts. Its course is just within the mucocutaneous junction (Fig. 5379).



Figs. 5380 and 5381.—The Same — II and III: — **a**, Seizing the margins of the vaginoperineum with tenaculum forceps at the sites selected as the upper limits of the U-shaped flap, preparatorily to testing the correctness of the selected points; — **b**, crossing the tenaculum forceps to verify the calculation, to see whether the resulting vaginal opening and perineum are properly proportioned.

Operation.—Having located the openings of the bartholinian ducts upon each side of the vaginal outlet (v. s.), the margins of the vaginal opening are seized, on each side, by a tenaculum forceps (Fig. 5380) — and these are crossed to opposite sides, approximating the torn and relaxed vaginal orifice — to ascertain by trial the proper calculation to make in order to restore the vaginal outlet, and at the same time not to too greatly narrow this opening (Fig. 5381). The tenaculum forceps are then returned to their own sides, and the vaginoperineal margin between them put upon the stretch. The sharp point of one blade of a pair of straight or angular scissors is carried flatwise (Fig. 5382) into the midpoint of the perineum — and for about 2 cm. ($\frac{3}{4}$ inch) into the rectovaginal septum. As a guide and safeguard at this stage, as well as to steady the tissues, the index-finger of the left hand is often

carried into the rectum – and always should be, if, owing to the extent of the destruction, this septum be comparatively thin. The inadvertent buttonholing of the rectum would probably result in infection and failure of the entire operation – and possibly in a rectovaginal fistula. The scissors cut is then carried along the tensed vaginoperineal margin, first upon one side and then upon the opposite side – to a point internal to the lower extremity of each labium minus.

As soon as the above section is made the outlined vaginal flap retracts in part – though not sufficiently for the subsequent manipulations. The vaginal flap should be freed backward to some extent, but not too extensively. Tait especially stressed that the denudation made by freeing the flap backward should *not* be too large – certainly not more than actually needed to accomplish the necessary steps. He himself scarcely dissected it backward

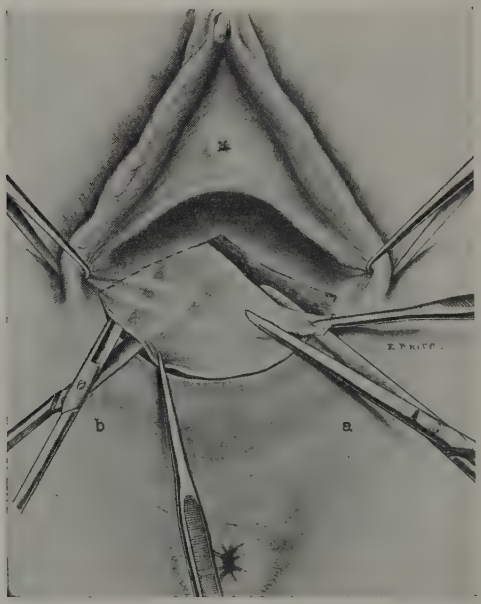


Fig. 5382.—The Same – IV; – Making the denudation of the vaginoperineal floor – by, a, Cutting strips of muco-areolar tissue from before backward – by, b, scissor mobilization and cutting in the connective-tissue plane. In both cases the outline of the area to be denuded is usually first made by knife.

at all. What backward freeing of the flap is felt to be necessary is best accomplished by seizing the free mobilized margin of the vaginal flap with non-traumatizing T-shaped forceps, and, while drawing the flap backward, over the side of the left index-finger, the right index-finger, covered with one or two layers of gauze, bluntly dissects, in the fascial plane, the underlying tissues from the deep surface of the flap (Fig. 5383). This freeing of the flap may have to be aided here and there by scissors snips, especially if much scar tissue be present. If in the course of this combined sharp and blunt dissection bleeding vessels are divided, these are clamped, and then tied with fine catgut. It is important that the wound be not subsequently disturbed by hematomata. The mobilization of the vaginal mucous flap should occur in a plane between the flap and the veins which lie between it and the rectum, and as long as the freeing progresses in this plane, the rectum is not apt to be injured.

The upward freeing and retraction of the vaginal flap brings into the field

Fig. 5383.—The Same _ V; _ The freeing back of the vaginal flap _ which is being drawn upward, over the finger, by lightly clamping T forceps _ while the flap is being bluntly dissected from the underlying structures by a gauze-covered finger

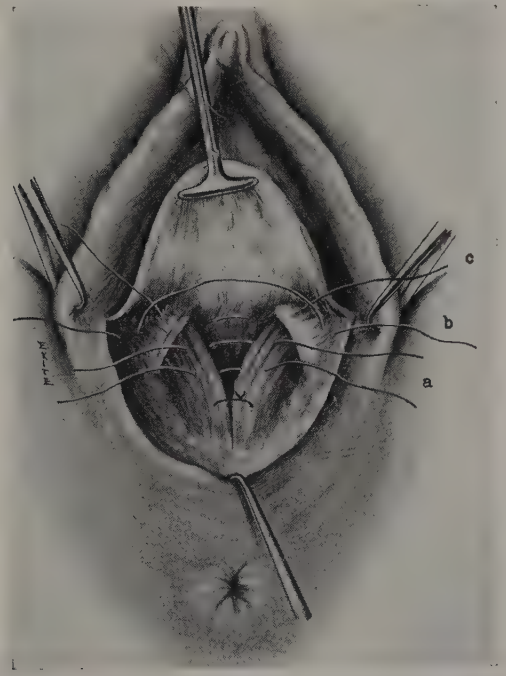
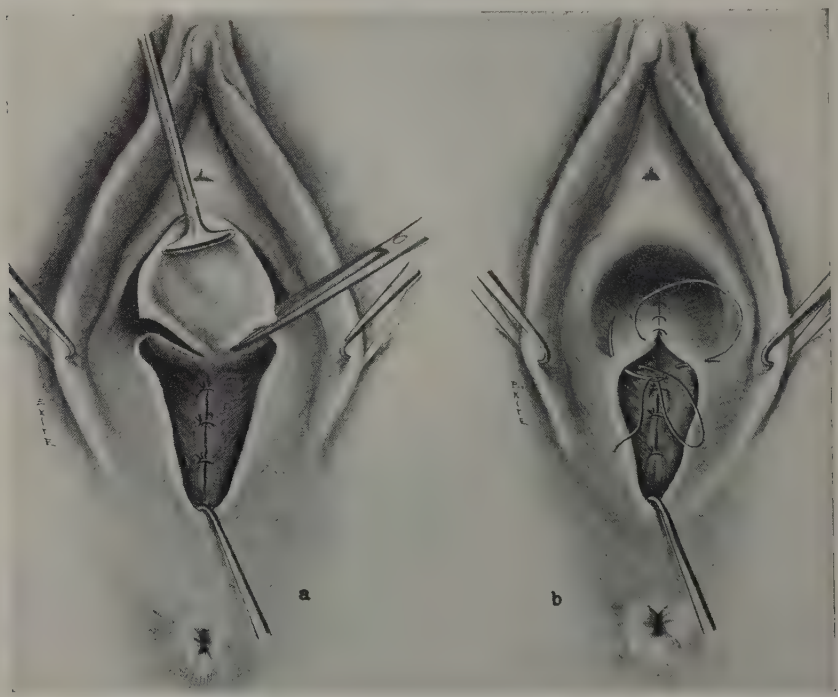


Fig. 5384.—The Same _ VI; _ The placing of the buried chromic catgut sutures, which are to bring together the separated margins of the fibromuscular pelvic sling or hammock. The upper sutures approximate opposite aspects of the transverse perineal muscle.

the musculofibrous structures which were torn in the laceration and retracted, or which, in simple relaxation, became stretched – or which became involved in both conditions. It is these structures which it is important to restore to their power of support to perineum and vagina. These structures have generally retracted, and are best brought into the field for suturing by carrying stout forceps into each lateral sulcus of the wound, grasping them and bringing them forward, where they are held, in turn, upon the two sides, while several transversely placed sutures of No. 1 forty-day chromic catgut sutures unite their opposite aspects (Fig. 5384). These sutures should not be too tightly tied, else in the reactionary swelling sloughing might take place. Not only should the muscle masses themselves be brought together, but the



Figs. 5385 and 5386.—The Same – VI and VII; – Closure of the wound: – a, The deep perineal structures are seen sutured – and the redundancy of the vaginal flap is being removed by a V-shaped excision; – b, the median suture of the vaginal flaps has brought together the muscular floor of the vagina – and is approximating the cutaneous margins of the face of the perineum – thus restoring the vaginoperineal outlet.

pelvic fibro-areolar tissue of the two sides should then be united in the median line over the restored pelvic sling by buried chromic catgut stitches.

The deeper parts having been united, the superficial wound is now ready for closure. There will usually be an excess of vaginal flap – the redundancy of which may be excised, in V-shaped fashion, to secure a neater apposition (Fig. 5385). The vaginal floor of mucosa is then closed in the median line by suture – and the face of the perineum, similarly, in the median line (Fig. 5386).

Variations in Technic in the Flap-splitting Operation.—As an alternative method of raising the vaginal flap the vaginoperineal septum may be opened up along its margin by traction in opposite directions, upon the

tenaculum forceps, and then cutting off the free border with scissors – which will give access for the further freeing back of the flap. Or the line of initial incision may, though with less ease, be made by means of a knife.

An alternative method of separating the vaginal flap from its underlying structures consists in pushing inward flatwise, through the scissors cut, or knife-incised border, a pair of Mayo scissors – carrying them to the depth to which it is desired to free the flap, and then gradually separating the blades or separating the blades *pari passu* with their inward progress.

In the technic as originally practised by Tait the vaginal flap was not especially freed backward, but simply allowed to retract – no elaborate dissection and bringing together of the separated muscle structures was practised – nor were the very margins of the skin and mucosa brought together. McKay

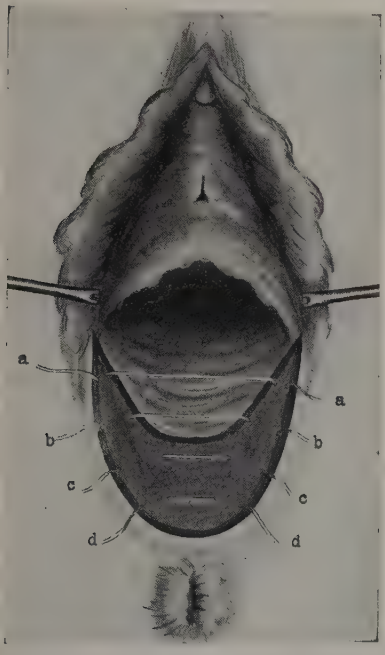


Fig. 5387.—Tait's Original Method of Placing the Closing Sutures – nowhere passing through mucosa or skin.

Fig. 5388.—The Closed Vaginoperineal Wound in Tait's Original Method.

describes the suturing of the parts as follows: – The point of the needle is buried on the patient's left *just within* the edge of the skin. Pressing down the rectum with the left index, the point of the needle is pushed into the tissues below the raw surface, emerging near the middle line. It is then carried *over* the median line, when it is buried into the raw tissues again, to finally emerge *just inside* of the skin margin (Fig. 5387). When the sutures were tied the vaginal flap was slightly puckered up in the median line, and the mucocutaneous margins both in the vagina and on the perineum were slightly everted – with the special object of forming a substantial median raphé (Fig. 5388).

Methods whereby the vaginal flap is dissected up in the dark, as it were, are much more apt to be accompanied by wounding of the rectum.

No matter what technic is being pursued, in all cases where there is

any reasonable likelihood or even uncertainty as to wounding the rectum, one or even two spread-out fingers should be introduced into the bowel. Upon the withdrawal of the fingers the glove should, of course, be changed.

In the Doléris flap-splitting method of repairing vaginoperineal laceration very little difference of technic from that above described is carried out. With the lower lateral margins of the vaginoperineal junction tensed and steadied with tenaculum forceps (Fig. 5389) – a curved incision with upward concavity is made along the line of junction of skin and mucosa. This incision is at first only over the middle 3 cm. ($1\frac{3}{16}$ inch). This initial incision is carefully made, but is carried past the fibrous tissue immediately underlying the mucocutaneous vaginoperineal outlet, into the pelvic areolar tissue, but

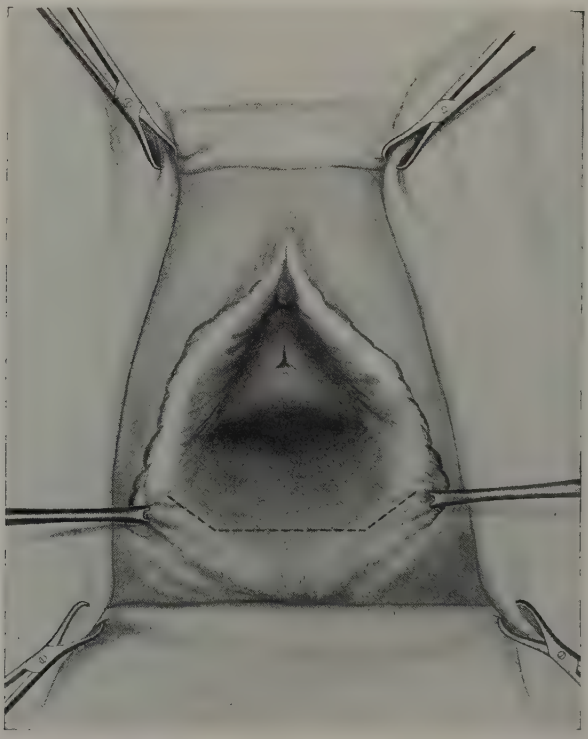


Fig. 5389.—Doléris' Flap-splitting Repair of Vaginoperineal Laceration – I; – The line of incision along the mucocutaneous junction of the tensed vaginoperineal outlet.

safeguarding the rectum. On the two sides of this median incision, its two continuations may be more deeply made, into the lateral vaginal sulci, by means of sharp-pointed scissors, which continue the cut as high up upon the sides as it is planned to carry it. The lateral tenaculum forceps may then be shifted, or additional ones are made to seize the middle of the free margin of the vaginal flap and the middle of the free perineal border, after which the wound is drawn in the opposite direction, anteroposteriorly. A finger may also be introduced into the rectum at this stage to safeguard the bowel. Under anteroposterior traction in opposite directions the vaginal flap of mucosa is now raised by combined sharp and blunt dissection – in one of the manners suggested in Fig. 5390. Having sufficiently retracted the flap the underlying muscular and fibrous elements of vaginal and perineal support

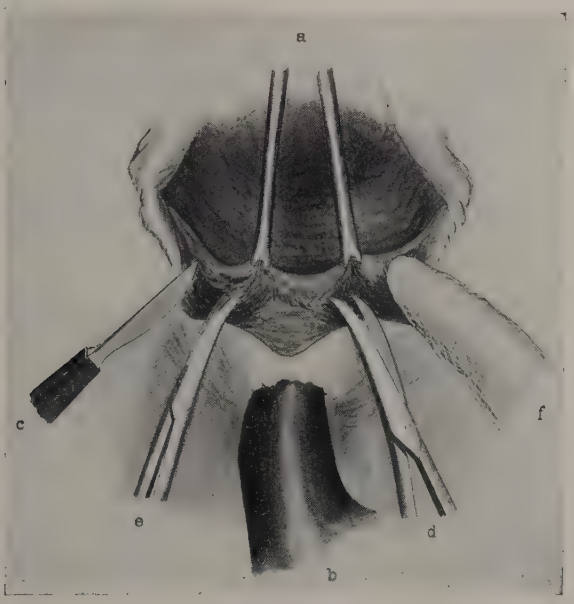


Fig. 5390.—The Same _ II; _ Freeing the vaginal flap: _ a, Tenaculum forceps drawing the flap upward; _ b, left index within the rectum as a guide and safeguard; _ c, dividing the connective tissue by knife; _ d, by scissors; _ e, freeing the flap by separating the blades of sharp-pointed scissors, inserted closed; _ f, blunt dissection with a gauze-covered finger.

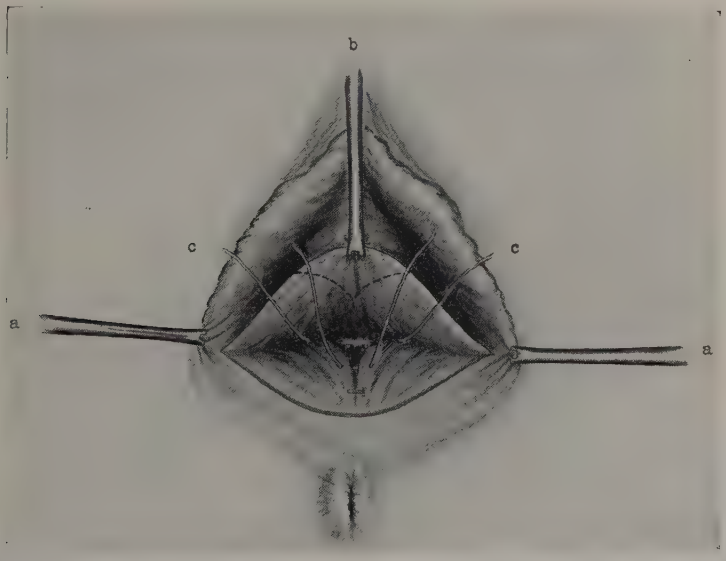


Fig. 5391.—The Same _ III; _ The deep musculofibrous structures have been brought together by the sutures, c; _ the redundant portion of the vaginal flap, b, is to be excised along the dotted lines.

are exposed as in the above technic _ and brought together by buried transverse sutures of resistant chromic catgut (by silver and aluminum-bronze wire in the original procedure _ Fig. 5391). These buried sutures may be

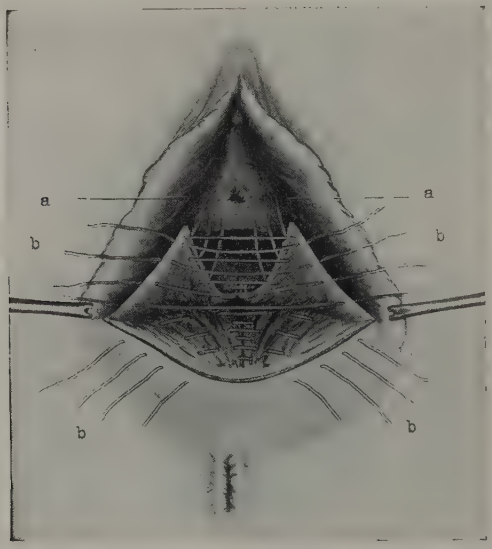


Fig. 5392.—The Same – IV; – The deep sutures have been tied – and the position of the superficial vaginal and perineal stitches is shown.

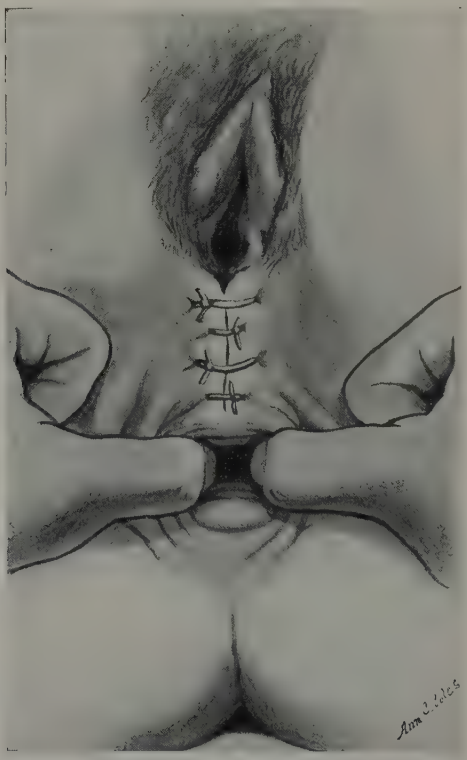


Fig. 5393.—The Method of Moderately Stretching the Anorectal Sphincter Adopted by Some as a Routine Ending of Operations for the Repair of Simple Vaginoperineal Lacerations (Where the Sphincter is Not Involved in the Tear).

in one or more layers, as indicated. The redundancy of the vaginal flap is excised (v. Fig. 5391, b). The manner of placing the closing superficial vaginal and perineal stitches is shown in Fig. 5392.

At the closure of operations for the repair of simple laceration of the vaginal floor and a portion of the perineum (short of involving the sphincter), some Operators are in the habit of moderately and carefully stretching the sphincter (Fig. 5393) – for the purpose of securing temporary relaxation. Of course this cannot be applied where there is any danger that the act itself will actually extend the tear into the rectum – and it is doubtful if there be indication for the application of the technic at all.

OPERATION FOR VAGINO-PERINEO-RECTAL LACERATION AND RELAXATION

BY TAIT'S FLAP-SPLITTING METHOD

Description.—In this form of laceration the tear takes place through a greater or less part of the floor of the vagina, through more or less of the

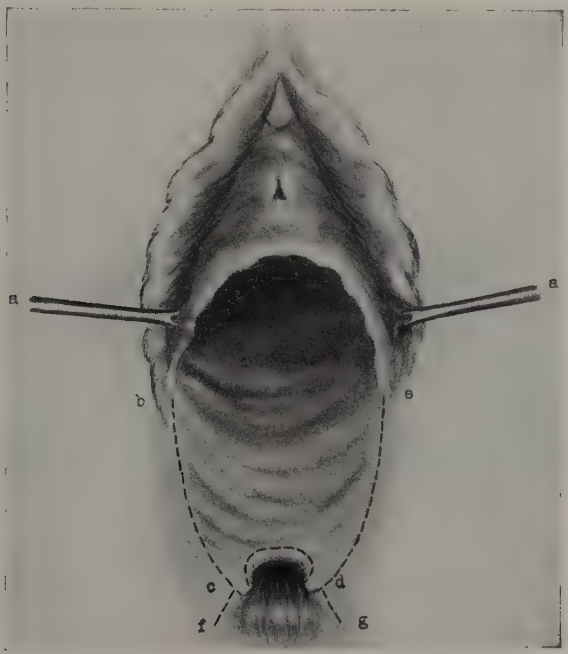


Fig. 5394.—Tait's Flap-splittimg Operation for Vagino-perineo-rectal Laceration and Relaxation – I; – The lines of the modified H-shaped incision: – bcde, The outline of the vaginal flap; – cd, curved, supramarginal incision, upon the perineal aspect of the perineorectal junction, outlining a narrow perineorectal flap; – cf and dg, incisions directed downward and outward from the main incisions for the purpose of exposing the ends and adjacent portions of the torn and retracted sphincter muscle.

perineal body, through the anorectal ring, and through some extent of the rectal wall. Tears passing through the rectal wall are usually median, though a lateral tear may be simultaneously present. The term "complete vaginoperineal laceration" is sometimes applied to this form of tear (though the above expression is anatomically more definite) – in contradistinction to the sometimes termed "incomplete vaginoperineal laceration," last described. The

fact that the laceration involves the rectum adds a major feature to the condition as such, and also to the procedure for the repair of the combined lesions.

The flap-splitting method of repair employed in vaginoperineal lacerations just described is also used here, except that instead of making a single vaginoperineal flap through a U-shaped incision, a major vaginoperineal and a minor perineorectal flap are raised through a modified H-shaped incision. The anorectal flap is usually not spoken of as such _ but, in reality, amounts to a narrow flap.

Preparation _ Position _ Analgesia _ Anesthesia.—As in the vaginoperineal operation (v. p. 191).

Landmarks.—Are the same as those given in the vaginoperineal operation

Fig. 5395.—The Same _ II; _ Making the irregularly H-shaped incision which outlines the larger vaginal and smaller perineorectal flap (the only contribution of the rectum to this flap being the perineorectal margin).

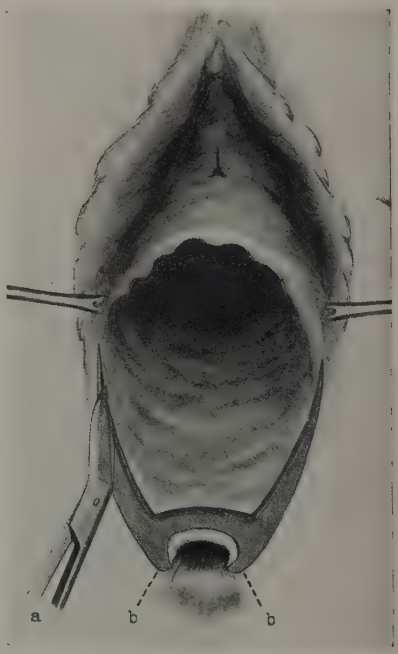


Fig. 5396.—The Same _ III; _ The incisions completed, freeing the margins of the larger vaginal or vaginoperineal and smaller perineorectal flaps.

(p. 192) as far as the vagina and perineum are concerned. In addition, a V-shaped rent has usually been made into the marginal and lower part of the anterior wall of the rectum _ which, in cases not immediately repaired at the time of happening, is generally eventually found rounded out, with upward convexity. Just above the lowermost margins of the two separated sides of the rectal tear two small dimples are usually to be recognized _ and represent the retracted, torn sphincter muscle, serving as important guides to the position of the two ends of the muscle which are to be brought together in the suturing.

Incision.—This will be described under Operation.

Operation.—It is noted by Tait, who is chiefly responsible for the popularity of the flap-splitting operation, that this is the only known instance of a lesion the scar of which is always and inevitably at a right angle to the wound

which it follows – as a result of the pull, in opposite directions, of the two ends of the ruptured sphincter (the wound being axial, and the two halves of the perineum being drawn apart transversely) – and that a recognition of this method of production and result of the wounded parts must be borne in mind as guides in the placing of the incisions and in the steps of repair. When the perineorectal scar is stretched, it will be found to consist of a horizontal line and of two short vertical lines, one at either end of the horizontal line, marking the position of the buried and retracted ends of the ruptured sphincter.

If much time have elapsed between the vagino-perineo-rectal tear and its repair the ruptured ends of the sphincter will have contracted, retracted, and

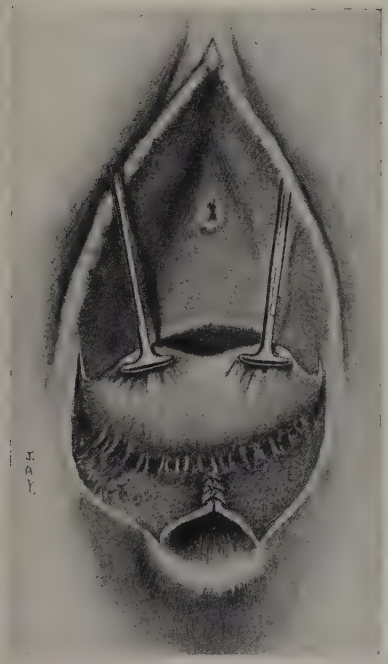


Fig. 5397.—The Same – IV; – Restoring the anterior perineorectal margin and wall by transversely placed, non-penetrating sutures, applied from the raw surface, which will tend to roll outward and downward the narrow perineorectal flap, thus lowering to normal the border of the perineorectal margin.

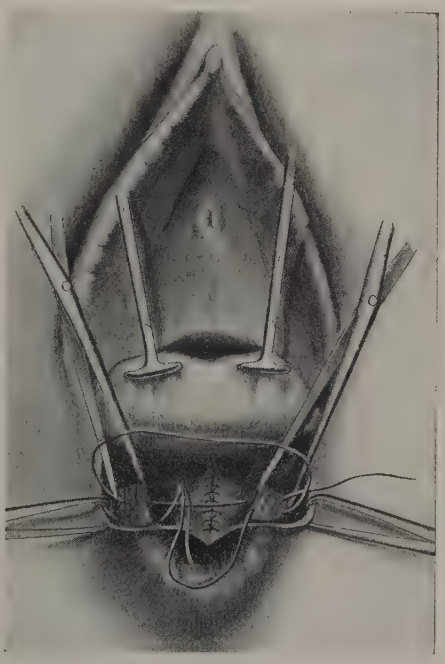


Fig. 5398.—The Same – V; – The torn and retracted ends of the sphincter muscle have been dissected from their beds and drawn into the field by forceps – and, while thus held, a couple of plain or mattress-stitches are so placed as to approximate their ends. The rectal margins are closed by non-penetrating sutures from within.

become partly atrophied. Before beginning the operation proper the involved sphincter must be well stretched – but carefully, so as to avoid a further tear in the weakened portion of the anorectal circle. This stretching is necessary in order to secure sufficient length of sphincter to reach around the restored anorectal wall – and even after repair the long unused and partially atrophied sphincter may be several weeks or months in regaining full control of the anorectal outlet. The stretching of the torn anorectal orifice must be even more carefully performed than in the stretching of the normal orifice as a part of the routine practised by some Surgeons in simple vaginoperineal tears – already shown in Fig. 5393.

The incision for the repair of the strictly vaginoperineal portion of the

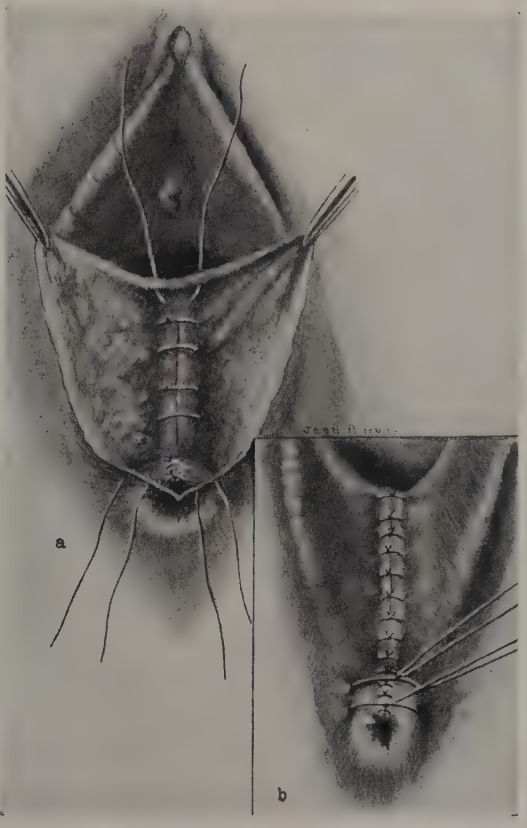
tear is practically the same as made for the simple vaginoperineal laceration. Having inserted a finger into the rectum, for safeguarding and guidance, one blade of a pair of sharp-pointed scissors is carried into the site of one of the dimples made by the torn, retracted end of the sphincter, at **d**, Fig. 5394 _ and carried to **c** (the opposite dimple) upon the perineal aspect of the junction of perineum and rectal mucosa _ the scissors going deeply enough over the two dimples to expose the retracted ends of the sphincter. The lateral incisions, **ed** and **bc**, begin just within the vaginal outlet, and just below the openings of the bartholinian ducts _ the former passing to the dimple **d**, and the latter to the dimple **c**. (These dimples are really where the ends of the incisions **cd** and **ed** meet, and **de** and **bc** meet, rather than exactly where the

Fig. 5399.—The Same _ VI; _ The torn sphincter has been repaired by buried sutures _ and two relaxation sutures of silkworm filament, **b**, have been carried through the ends of the sphincter and adjacent skin, at a short distance from its margins. The margins of the levator muscles are sutured together by buried sutures, **c** _ and the more superficial perineal connective-tissue plane and torn transverse perineal muscles are being similarly brought together by buried sutures.

letters **d** and **c** are shown in the picture.) Finally, the incisions **dg** and **cf** are made, extending from each dimple a short distance over the course of the corresponding side of the torn sphincter, so as to expose enough of the ends of the sphincter for manipulation. These incisions are also best made with sharp-pointed scissors (Fig. 5395). When the incisions are everywhere completed, a larger vaginal and a narrow smaller perineorectal flap are formed (Fig. 5396). Both of these flaps must be sufficiently mobilized to expose beneath them the parts which are to be brought together by suture. This freeing of the vaginoperineal flaps is accomplished exactly as described and pictured in the repair of vaginoperineal tears by the flap-splitting method (v. p. 193) _ and the limited freeing of the narrow flap respresented by the perineorectal margin is accom-

plished by the combined rolling forward and downward of this little flap (as one does a coiled-up rose leaf) and by limited scissors snips.

The torn sphincter is first repaired. Preceding the actual bringing together of the ends of the sphincter the torn anterior portion of the anorectal orifice is reconstructed. Where the rectal tear has not extended up the anterior rectal wall for any distance, the mere mobilization of the small perineorectal flap may suffice. If, however, the upward extent of the tear has been sufficient to have originally caused a marked inverted V in the anterior wall of the rectum, which has subsequently been leveled out to an almost hori-



Figs. 5400 and 5401.—The Same – VII and VIII; – a, The buried stitches of the pelvic sling have been placed and tied – and the two relaxation sutures of the sphincter ani placed, but not tied; b, the relaxation sutures of the sphincter have been tied – and the marginal vaginal sutures.

zontal line, then a few non-penetrating, chromic catgut sutures may be placed in the rectal wall, from the raw surface, as shown in Fig. 5397 – which will tend to keep the little flap rolled out and downward, and to lower its inferior edge, so as to be more in keeping with the rest of the level of the anal orifice. (These stitches are sometimes introduced from the rectal mucosal side – but, then, must expose the wound to infection from the rectum.)

When the anterior aspect of the anal orifice has been repaired and lowered, the next step consists in freeing and uniting the ends of the torn and retracted sphincter. These are isolated by dissection, and brought out into the field by tenaculum forceps or non-traumatizing clamp forceps (Fig. 5398). While

thus held, two or three chromic catgut stitches are carried through their ends – either simple or, preferably, mattress-sutures (or some other form of reinforced stitch). The restored sphincter and the deep perineal sutures are seen in 5399.

Having thus repaired the anterior anal orifice and the sphincter muscle, the rest of the operation is, practically, the same as that described for simple vaginoperineal lacerations (v. p. 193). The upward freeing of the vaginal flap is accomplished as there described. When this has been accomplished and the deeper musculofibrous structures of the pelvic floor are brought into the field – especially the torn and retracted muscular tissues – these are also sutured together in the same manner as already described under the repair of the simple vaginoperineal tears (v. s.) – (v. Fig. 5399).

Fig. 5402.—Method of Raising the Flaps and Placing the Sutures in the Original Tait Operation for Vagino-perineo-rectal Laceration.

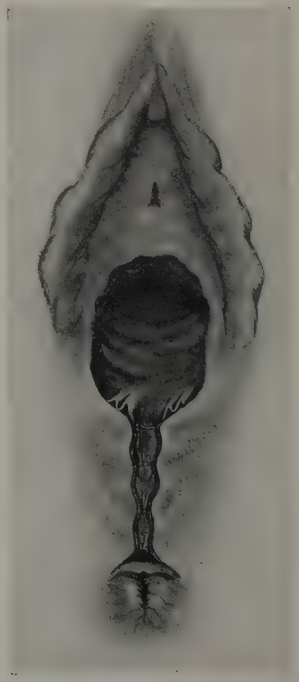


Fig. 5403.—Completed Operation in the Original Tait Procedure.

The torn muscle tissue of the anorectal region and that underlying the floor of the vagina having been thus brought together by suture, and the excess of vaginal flap excised in V fashion, the mucocutaneous margins of the wound are sutured in a single median line, extending from the highest part of the opening in the vagina to the anorectal margin. The marginal sutures, placed at the vaginal and anal ends of the line of union, by which the margins are brought together over the underlying buried chromic catgut sutures, are shown in Fig. 5400. When a couple of these have been placed and tied at each end, they serve as tractors whereby the margins are drawn parallel and the rest of the suturing made easier. Before placing the lowemost sutures in this line it is well to carry two deep silk-worm relaxation sutures through the skin and the ends of the sphincter, so as to take the primary strain off of

the buried coaptation sutures originally placed to hold the ends of the sphincter together (v. Fig. 5400). The completely sutured wound is seen in Fig. 5401.

Variations in the Technic in the Flap-splitting Operations for Vagino-perineo-rectal Laceration.—In Tait's original procedure for the repair of vagino-perineo-rectal laceration, as in his operation last described, for simple vaginoperineal laceration (v. p. 193), no detailed dissection and approximation of the torn pelvoperineal muscle tissues was practised _ nor were the very margins of the skin and mucosa brought together. The vaginal flap was not so deliberately dissected upward. The narrow marginal anorectal flap was "unfolded," as it were, and drawn downward by two tenaculum hooks before

Fig. 5404.—Modified Method of Applying the H-shaped, Flap-splitting Operation to Vagino-perineo-rectal Laceration _ I; _ The lines of section, and the beginning of the freeing of the vaginoperineal and perineorectal flaps.

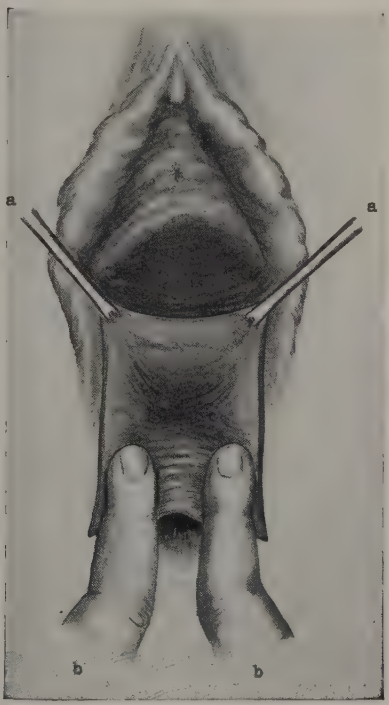


Fig. 5405.—The Same _ II; _ Completing the freeing of the vaginoperineal and perineorectal flaps by blunt dissection with the two index-fingers.

suturing the wound. The general method of placing the sutures is shown in Fig. 5402 _ and the full sutured wound, or the wound sutured to the extent to which sutures were applied, is seen in Fig. 5403. Considerable surfaces were allowed to heal by granulation, and the excess of both vaginal and anorectal flap was allowed to disappear by shrinkage.

The H-shaped type of exposure and the suturing of the exposed parts is sometimes rapidly performed in the following modified manner: _ A simple H-shaped incision is made over the vaginoperineal aspect of the site _ the almost vertical limbs of the H passing down the sides of the vaginal outlet, from below the sites of the bartholinian duct openings, nearly to the margin of the lateral aspects of the perineorectal junction _ the horizontal limb of

the incision passing a short distance above the level of this junction (Fig. 5404). A finger is inserted into the rectum for guidance and safety, and the freeing of the lower aspect of the flap is started with scissors. The free edge of the flap is then seized with two tenaculum forceps and steadied – while the two index-fingers are inserted into the connective-tissue plane – working from the median line toward either side – until the flap is sufficiently mobilized (Fig. 5405). The structures of the musculofibrous sling are exposed by blunt and sharp dissection – until the torn margins of the levatores ani and of the sphincter are brought into the field – and buried sutures passed for the ap-

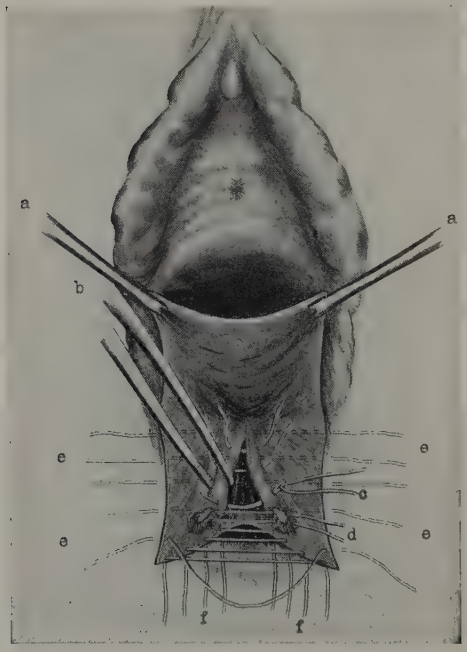


Fig. 5406.—The Same – III; – The deep musculofibrous structures of the pelvic sling are exposed, and the separated and torn tissues are being united: **c**, One of a series of buried chromic catgut sutures approximating the borders of the levator ani muscle; – **d**, buried sutures uniting the torn sphincter muscle; – **e, e**, sutures uniting the mucocutaneous borders of the wound, and buried in the more central portions of wound; – **f, f**, sutures restoring the anorectal orifice – and passed, in this instance, from the rectal aspect; – **a, a**, the vaginoperineal flap is being retracted upward.

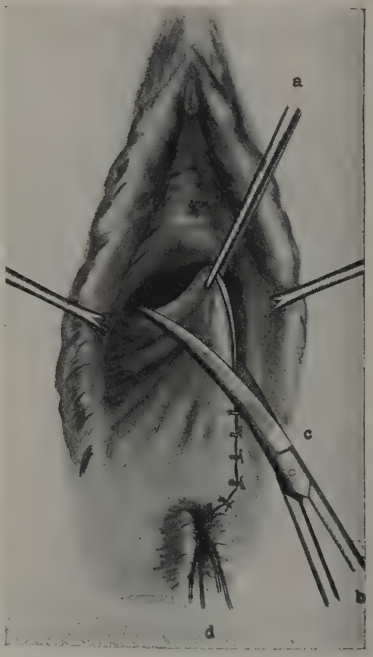


Fig. 5407.—The Same – IV; – The sutures restoring the anorectal outlet are seen emerging from the anal orifice. The sutures closing the lower portion of the perineal wound are tied. Scissors are excising the redundancy of the upper portion of the vaginoperineal flap.

proximation of the separated borders of the former and ends of the latter (Fig. 5406). Additional sutures are passed for the restoration of the anorectal outlet – being passed, in this instance, from the rectal aspect. When tied the lowermost sutures will make their exit through the new anorectal orifice – the margins of the perineal face of the wound are approximated – and the excess of loose vaginoperineal flap tissue is excised (Fig. 5407). Sutures are placed through the borders of the vaginal portion of the flap left after the V-shaped excision of the redundancy – the entirely sutured wound then appearing as shown in Fig. 5408.

Note.—Throughout the above descriptions of the flap-splitting operations for the repair of vagino-perineo-rectal laceration, the terms "vagionoperineal," "perineo-anal," or "perineorectal," are all used with practically equivalent

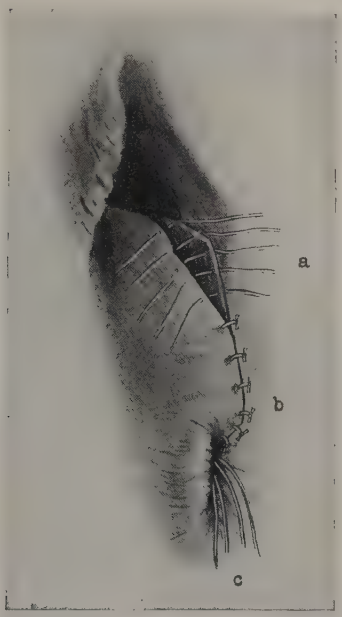


Fig. 5408.—The Same – V; – The uppermost sutures are being placed – the rest of the wound is sutured.

meaning – to cover the varying conditions in which more or less of the ano-rectal wall may be involved in the rupture.

The references to and illustrations of the original Tait technic, as applied to the repair of vaginoperineal and vagino-perineo-rectal lacerations, are modified from the work of McKay.

OPERATION FOR VAGINOPERINEAL LACERATION AND RELAXATION

BY EMMET'S MEDIOBILATERAL OR "BUTTERFLY" DENUDATION

Description.—In this form of laceration the rupture occurs through the floor of the vagina into and through a variable extent of the structures of the perineal body – but not into the rectum. The tear is usually median, but may be lateral, bilateral, or irregular, or in various combinations of these.

The special features of the present operation (originally worked out by Emmet, and subsequently modified in various details by others – the operation as performed by Kelly and by Noble being here given) consists in the recognition of the fact that loss of support of the female organs, given by the pelvic diaphragm, as well as of the bladder in front, and of the rectum behind, occurs not only through vaginoperineal lacerations which are externally demonstrable, but as well, and in addition, may also occur by either rupture or simple yielding (relaxation) of the musculofibrous pelvic floor, without accompanying laceration of the mucocutaneous structures. The importance of repairing the torn or relaxed levatores ani and deep pelvic fascia has been subsequently even more fully appreciated than when attention was, at first, only directed to the defective pelvic fascia as the chief causative agency.

The form of denudation through which the parts are exposed has been, somewhat fantastically, likened to the contour of a butterfly with outstretched wings. It may also be likened to a Y – the two limbs of the Y representing the lateral denudations in the vaginal sulci, and the vertical limb, the median perineal denudation – the form of the fully sutured wound more nearly bearing out the outline of the Y. The present description of the technic and the illustrations are modified chiefly from the works of Kelly, of Noble, and of Graves.

Fig. 5409.—Operation for Vaginoperineal Laceration and Relaxation – By Emmet's Mediobilateral, or "Butterfly" Denudation – I; – Two double-toothed, self-retaining tenacula grasp the upper aspects of the vaginal outlet, within the labia minora, and retract them laterally, marking the upper limits of the vaginal denudation. A tenaculum forceps seizes the redundant vaginal floor and draws it downward, thus exposing and tensing the lateral vaginal walls for the incisions and subsequent denudation.

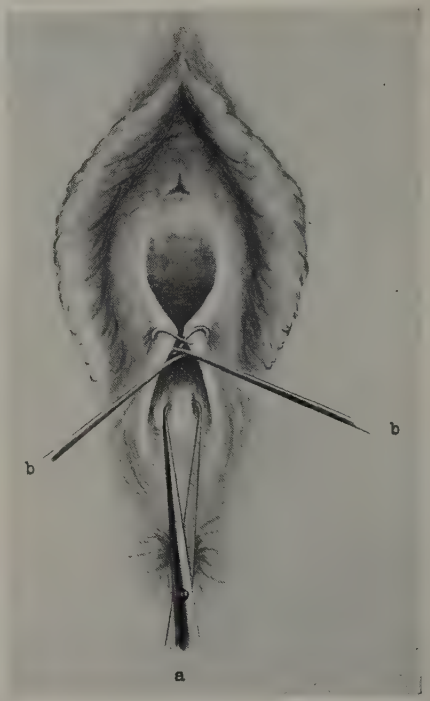


Fig. 5410.—The Same – II; – Two shepherd-crook tenacula draw the upper limits of the lateral lines for the incisions together, while the tenaculum forceps draws the loose floor of the vagina downward, thus enabling the operator to make a trial approximation of the parts to determine whether the correct calculation for denudation has been made.

Preparation – Position – Landmarks – Anesthesia – Analgesia.—As in the operation for vaginoperineal laceration and relaxation, by the flap-splitting method (v. p. 191).

Incision.—The lines of incisions are determined by the needs of the particular case, and are only decided upon after trial approximation of the opposite vaginal lips, to learn the amount of denudation required to establish the desired vaginal outlet. This is accomplished by seizing the remains of the hymen, upon each side, and below the openings of the ducts of the vulvo-

vaginal glands, either with tenaculum forceps (Fig. 5409) or with special shepherd's crooks. By crossing the tenacula or hooks to the opposite side the amount of narrowing of the vaginal opening will be determined (Fig. 5410). If a third tenaculum forceps be made to clamp the median vaginoperineal wall a short distance posterior to the fourchet, and just distal to the lowermost limit of the planned denudation, the three tractors will not only enable the calculation to be satisfactorily made, but when finally placed as circumstances indicate in the particular case, will also serve as the three guiding limits inside of which the outermost line of the Y-shaped denudation is to be placed. If the third tenaculum forceps be of a somewhat heavy type, it will helpfully serve as a depressor and tractor of the vaginoperineal floor during denudation.

A fourth instrument, a lighter tenaculum forceps, grasps the posterior vaginal floor, in average condions, at a point which will be at the end of the

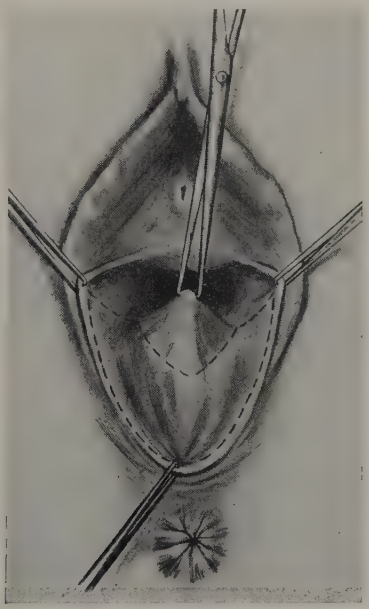


Fig. 5411.—The Same – I; – Exposure of the area for denudation – which is indicated by dotted lines, aided by tensing forceps.

operation between 5 and 10 mm. (3/16 and 6/16 inch) inside of the site of the remains of the hymen (Fig. 5411). The greater the rectocele, if any be present, the higher up the posterior vaginal wall is the fourth instrument placed – and *vice versa*.

It will be seen, when these four instruments are drawn upon, that three triangles are outlined – a major triangle, represented by the two lateral and lower median perineal tenaculum forceps – and two smaller lateral triangles (really included in the major triangle), their base extending between a lateral and the lower median tenaculum forceps, and their apices extending up the lateral vaginal sulci. They also serve as guide for outlining the area of bilateral denudation – in every direction save one, that is, the upward extent in the vaginal sulci to which the denudation within the vagina is to be carried, leaving an undenuded central tongue between these two upward extensions – and the height of upward extension must be determined, in each individual case,

by the needs of that case – the greater the rectocele, if any, or the greater the gaping of the vaginal outlet, or the greater the relaxation, the higher upward are the lateral denudations made (as well as the shorter the undenuded tongue) – and *vice versa*.

All is now ready for the making of the incisions. Putting one of the lateral and the central tenacula on the stretch, an incision is made outward with a knife from the apex of one of the smaller triangles, beginning, in average conditions, about 3 cm. ($1\frac{3}{16}$ inch) within the vaginal opening – starting at the junction of the anterior and lateral vaginal walls (which is to one side of the median aspect of the vaginal floor which is depressed during the making of the incision), and extending outward, parallel with the anterior wall of the vagina, to just below the lateral tenaculum of that side. Beginning again

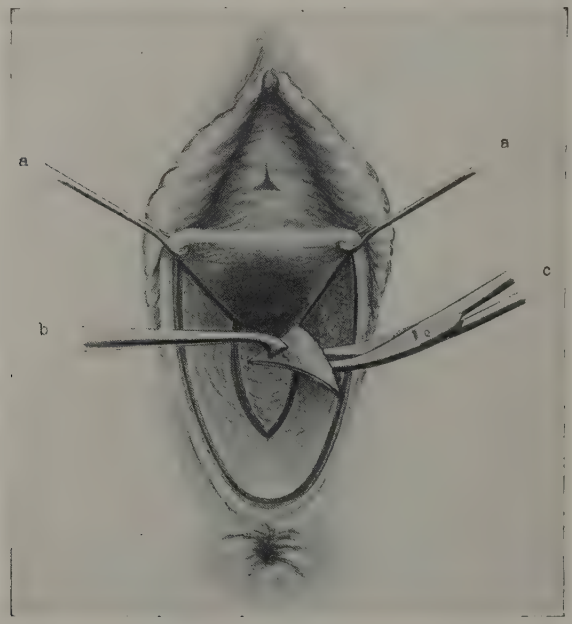


Fig. 5412.—The Same – II; – Having outlined with a knife a tongue-shaped area of proper size upon the posterior vaginal floor, and carried a U-shaped incision through the vaginoperineal junction (connected, above, with the upper limits of the tongue-shaped incision), the included yoke-shaped area of vaginal floor and wall is being removed (in a single piece where possible) by means of curved scissors aided by special tissue forceps.

at the same point, in the upper part of the lateral sulcus, the second side of the lateral triangle is cut by an incision which rounds into the median line of the vaginal floor at a point just below the central tenaculum. The same incisions are made upon the opposite side – thereby outlining the second smaller triangle, and leaving, in the middle, a narrow, roundedly pointed, undenuded tongue of mucosa. Finally, the semi-elliptic incision is made, beginning just below one lateral tenaculum, within the remains of the hymen – passing down to, and within, the outer median tenaculum, embracing (including) all scar tissue – and up to just below the opposite lateral tenaculum, within the remains of the hymen. The middle of this incision is usually from 3 to 4 cm. ($1\frac{3}{16}$–$1\frac{9}{16}$ inch) below the central tenaculum. It will be seen that these incisions pass through several planes.

The forked area within these incisions is now denuded of its mucosa – which

is best accomplished in strips by means of Emmet's right and left scissors curved on the flat. The mucosa is steadied with toothed forceps, while the mucosal strips are raised either parallel with the major incision, or from this incision toward the apices of the smaller triangles. Sometimes the denudation is accomplished in a single layer (Fig. 5412). It is important that no islands of mucosa be left.

When the denudation has been completed the appearance of the parts is as shown in Fig. 5413. All bleeding should be controlled before proceding _ either by gauze pressure or by ligature with fine catgut. The coaptation

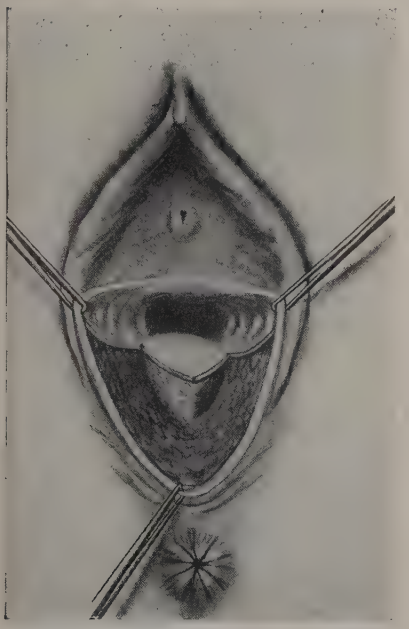


Fig. 5413.— The Same _ III; _ The appearance of the mediobilaterally denuded vaginoperineal floor.

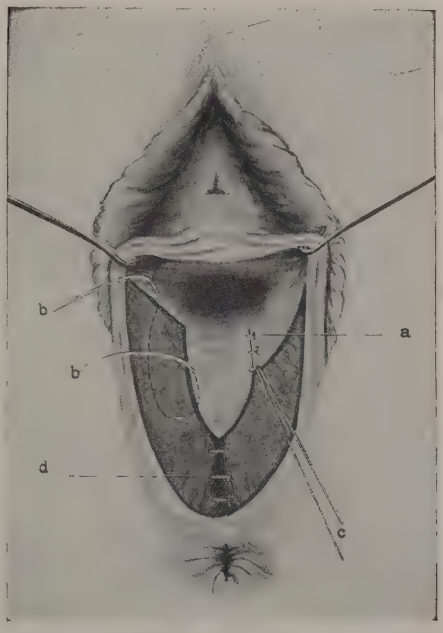


Fig. 5414.—The Same _ IV; _ Kelly's Method of Suturing the Wound: _ **b, b,** A silkworm stitch opposite the center of the tongue undenuded; _ **c,** using this stitch, when tied, as a tractor, while placing adjacent stitches above it; _ **a,** superficial and half-depth chromic catgut sutures, uniting the margins of one of the smaller, lateral triangles, above the position of the silkworm stitch; _ **d,** buried sutures of the deeper pelvic musculofibrous structures _ here shown, as often employed, but not necessarily a part of the Kelly technic.

of the parts in the subsequent steps is, however, usually alone effective in controlling hemorrhage.

Some difference of technic has been practised in placing the sutures. Kelly's method is, in the main, as follows: _ A single silkworm suture is placed through the center of the opposite walls of each of the two lateral triangles (Fig. 5414, **b, b**) _ inserted by means of a silk carrier, while the walls of the triangle are held apart by tenacula. This stitch is everywhere hidden by the tissues except where it appears, to again enter, at the bottom of the sulcus, which is especially made at a lower level than that of its entry at the mucosa, so that, when tied, it will distinctly lift the parts upward. This silkworm suture

upon each side is, when tied in a square knot (v. Fig. 5414, **c**), then used as a temporary tractor – during tension upon which two or three No. 1 chromic catgut sutures are placed between the opposite margins of the small triangle, above the silkworm suture, and passing deeply into the tissues, to prevent pocketing (v. Fig. 5414, **a**). Thus the upper aspects of both smaller lateral triangles are closed (Fig. 5415, **a** and **b**). If the triangular areas be large and deep, each silkworm suture may be reinforced by a half-depth No. 2 chromic catgut stitch placed below it.

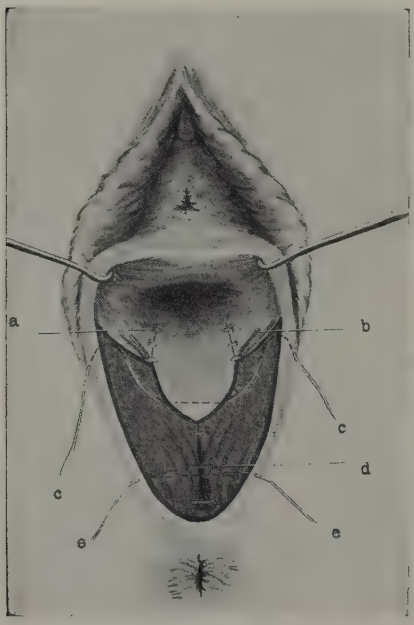


Fig. 5415.—The Same – V; – The two silkworm sutures have been tied, and the superficial and half-depth chromic catgut stitches above them: – **c, c,** The crown stitch of silkworm filament is then placed, as here shown, and as described in the text; – **e, e,** an auxiliary chromic catgut suture, taking a deep hold of the parts in the lower part of the wound. Some buried sutures, of the deeper musculofibrous tissues are also seen not necessarily a part of the Kelly technic.

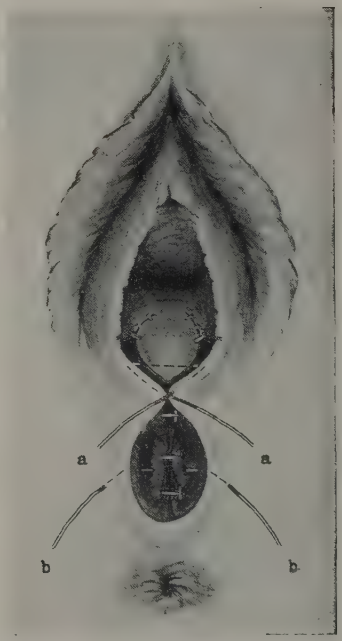


Fig. 5416.—The Same – VI; – The crown suture, **a, a,** is being tied. A deep auxiliary stitch, **b, b,** is seen placed. Deep buried sutures are also seen.

A crown suture or gathering suture of silkworm filament is next placed (v. Fig. 5415, **c, c**). This is inserted upon a carrier – entering the margin of the upper end of the semi-elliptic incision just below the angle – travels buried for a part of its course – then emerges – and again enters the tissues beneath the free end of the undenuded mucosal tongue – and, passing under this, repeats the course upon the other side. While the wound is still open a second deep suture of chromic catgut or silkworm filament is passed midway between the crown stitch and the lower limit of the wound (v. Fig. 5415, **e**). The crown stitch is now tightened (Fig. 5416, **a, a**), thereby neatly and accurately coaptating the upper limits of the lateral denudations and the depths of the wound about the undenuded central tongue of tissue. When

there is much relaxation Kelly states that it adds to the efficiency of the operation if the levatores ani muscles are exposed in the pelvic wound and are included in the deep silkworm sutures. It may also be said that it is often also helpful to add a few buried chromic catgut sutures to approximate the deeper parts (v. Figs. 5414–5416). Finally, the portions of the vaginal and perineal wound remaining open are brought together by a few half-depth and superficial marginal sutures (Fig. 5417).

Noble's method of suturing the wound differs somewhat from the above – the technic being here described in his words: – "The method of introducing the suture is a variation from the original V-shaped suture of Emmet and is

Fig. 5417.—The Same – VII; – The finally sutured vaginoperineal wound.

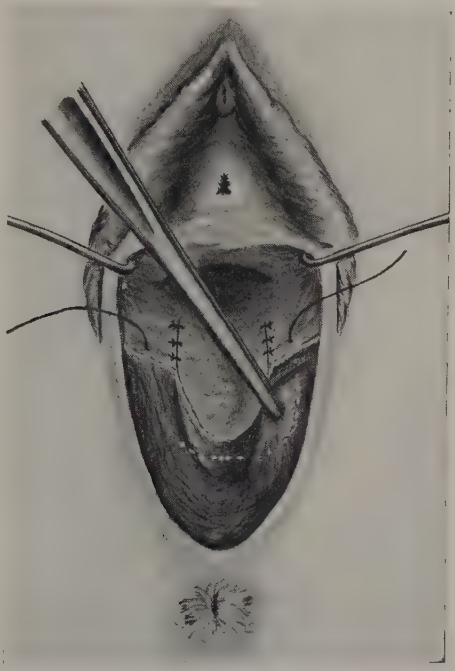


Fig. 5418.—Method of Inserting the Muscle-binding Sutures in the Repair of Vaginoperineal Laceration by Bilateral Denudation; – The initial sutures in the sulci have been placed and tied. The method of drawing forward the separated anterior borders of the levator ani muscles, so as to include them in the sutures which will approximate their fascial coverings, is shown.

believed to give a better 'lift.'" The Emmet suture emerges at the bottom of the sulcus, the two sides of the V being of corresponding length. If the vaginal wall is not pushed within the pelvis, and if, on the contrary, it is drawn forward toward the Operator, the effect of the suture may be to roll the posterior vaginal wall out instead of rolling it back within the pelvis. Two sutures passed after this manner are usually sufficient to dispose of the rectocele and to attach the posterior vaginal wall to the levator ani muscles. The last or "tension" suture should be just within the border of the levator ani muscle. The location of this muscle should always be determined before placing these sutures. Figure 5418 illustrates the mode of passing the sutures. The denudation in the opposite sulcus is now sutured in a similar manner.

The crown suture is next passed. This should be of medium weight catgut and is a superficial suture throughout. It is passed first through one lateral vaginal wall, the tip of the posterior vaginal wall, and then through the opposite vaginal wall. This suture is about ½ cm. (1/5 inch) within the hymen, which is about opposite the anterior border of the levator muscle. The next suture should be of silkworm-gut, and its special purpose is to approximate the anterior borders of the levator muscle covered with their fascia, so as to obtain the fascial union, and in this way imitate the union of the slips from the levator ani muscle which unite in the rectovaginal septum. The needle is introduced through the lateral vaginal wall just within the hymen, and passes rather superficially from before backward and from above downward for about 1 cm. It is then made to pass deeply into the left sulcus until the anterior border of the levator muscle is caught in the depths of the sulcus. This maneuver may be facilitated by picking up the border of the levator muscle with a dissecting forceps. The needle is then brought out of the sulcus and is made to catch up some tissue at the border of the wound. It is then passed into the right sulcus deeply enough to catch the anterior border of the levator muscle, after which it is passed through the tissues of the right side in a manner corresponding with the left. When tied this suture will approximate the anterior borders of the levator ani muscle. This procedure may be modified by burying a catgut suture to approximate the anterior borders of the levator ani muscle, or a silkworm-gut suture may be passed in the form of an 8. The next silkworm-gut suture is introduced at the plane of the hymen to approximate the torn deep pelvic fascia. One or two deep sutures suffice to approximate the wound in the skin perineum. Silk is usually used for this purpose, as these external sutures are usually removed at the end of a week, whereas the internal ones remain for two weeks. If superficial sutures are needed, they should be of light weight (No. 1 or No. 2 catgut). . . . Continuing, he states:_ The operation described differs from the typical Emmet operation in several particulars. In the typical Emmet operation the crown stitch is inserted in the skin external to the hymen, passes through the vulvovaginal junction, skips the tissues in the sulcus, catches the tip of the mucous membrane upon the posterior vaginal wall, and is brought out through the vulvovaginal border upon the opposite side in a corresponding way. The result of tying the crown stitch introduced in this manner tends to draw the posterior wall of the vagina between the lateral structures which should be united at the vaginal outlet, and in so much tends to prevent union of the borders of the levator ani muscle and of the deep pelvic fascia. As a consequence, the result of the operation is often to give a somewhat gaping introitus; and for the same reason it fails in many cases to furnish adequate support because the lateral structures at the vaginal outlet are not brought together in the median line. The operation which has been described may be said to combine the advantages of the Emmet operation with those of the Hegar operation. The denudation of the two sulci and the sutures introduced in the sulci are made use of to roll back the loose tissues of the rectocele within the vagina and to fasten the posterior vaginal wall and anterior and lateral rectal walls to the levator ani muscle. A firm introitus is also secured, as is the case with the Hegar operation. What is novel in the operation as I have practised it is the securing of fascial union of the anterior borders of the levator ani muscle in the median line in order to imitate the normal union of the slips of muscle from the levator ani which unite in the median line in the rectovaginal septum. This restores the vaginal outlet more nearly to the normal than is true of the Hegar operation. Also the method of introducing the sutures in the sulci is believed to be superior to the V-shaped suture of Emmet.

In concluding the operation, the vagina is flushed, or wiped with gauze, to remove blood-clots _ the ends of the silkworm sutures are left long, and are folded back into the vagina _ a small gauze drain is placed in the floor of the vagina _ the wound may be dusted with sterile boric acid or, better, aristol _ and a gauze-and-cotton pad applied, and held in place by a T-bandage.

OPERATION FOR VAGINO-PERINEO-RECTAL LACERATION AND RELAXATION

BY EMMET'S MEDIOBILATERAL OR "BUTTERFLY" DENUDATION

Description.—What has been said under Description in connection with the flap-splitting operation for vagino-perineo-rectal laceration (p. 201) in so far as the nature of the injury is concerned, also applies here _ the rupture

Fig. 5419.—Operation for Vagino-perineo-rectal Laceration by Emmet's Mediobilateral Denudation _ and by Noble's Method of Repairing the Sphincter Ani and Rectal Wall _ I; _ The area of denudation, with the position of the sutures: **ee, ff, gg,** Sutures passed from within the rectum, to restore the anterior rectal wall; _ **dd,** relaxation suture passing through the substance of the sphincter, at a greater distance from their free ends than here shown; _ **cc,** deeply placed silkworm suture, passing from the skin surfaces through the sutures of the musculofibrous pelvic sling; _ **bb,** silkworm crown; stitch, the outer marginal exits of which being here represented somewhat too low; _ **aa, aa, aa,** sutures closing the smaller lateral triangles.

taking place through more or less of the perineal body, through the anorectal ring, and through some extent of the anterior rectal wall _ the conditions being exaggerated by the accompanying relaxation usually present. Tears passing through the rectal wall are usually median. The term "complete lacerations," sometimes applied, is less full and accurate than the designation heading this description.

The fact that the laceration involves the rectum constitutes the major feature of the condition _ and calls for special effort for its repair.

Preparation _ Position _ Landmarks _ Analgesia _ Anesthesia.—As in the operation for vagino-perineo-rectal laceration by the flap-splitting method (v. p. 202).

Incision.—Given under Operation.

Operation.—As far as the vaginoperineal portion of the repair is concerned, the technic in it, and in the repair of vagino-perineo-rectal laceration by mediobilateral denudation (p. 209) is precisely the same _ and will not be again described here. The repair of the rectal wall and sphincter muscle constitutes the distinctive feature _ and will be here gone into at length. Two methods of dealing with the rectal portion of the lesion will be considered _ Noble's and Kelly's.

Fig. 5420.—The Same _ II: _ e, The sutures closing the anterior rectal wall have been tied; _ b, c, freeing the torn and retracted right end of the sphincter ani; _ b, d, excising the scar-tissue-covered left end of the sphincter _ preparatory to their union.

Operation for Vagino-perineo-rectal Laceration by Emmet's Mediobilateral Denudation of the Main Wound _ and by the Kelly-Noble Method of Repairing the Sphincter Ani and Rectal Wall.—The extent of this procedure will depend upon whether simply the external sphincter ani is torn, or whether, in addition, the anterior rectal wall is limitedly or extensively ruptured, including laceration of the internal sphincter. The preliminary preparation of the intestinal tract should be carried out with unusual care, as either fecal flow during the operation or scybalous masses immediately after may ruin the outcome of the procedure. The bowels should be emptied well in advance by both general and local means _ and kept from moving for a few days after the operation.

The lines of incision, as far as the upper aspects of the vaginoperineal

tract are concerned, are the same as in the vaginoperineal laceration. In the lower part of the tract the incision should pass over the pits or dimples formed by the retracted ends of the torn sphincter ani muscle _ and should pass along the line represented by the junction of the rectal mucosa and the torn perineum (Fig. 5419) _ where a scheme of the entire denudation and the position of the various sets of sutures are shown. The denudation is made by scissors and forceps as in the preceding operation _ extending the denudation within the vagina for 1 cm. (7/16 inch) at least above the uppermost limit of laceration.

The suturing of the torn rectal wall is first carried out. The sutures are of No. 1 chromic catgut, and are applied from within the rectum _ at a distance of about 7 mm. ($\frac{1}{4}$ inch) apart _ entering the rectal wall at about 5 mm. (3/16 inch) from its margins. The highest suture should be first applied _ and each suture should be tied within the rectum as placed, the ends being

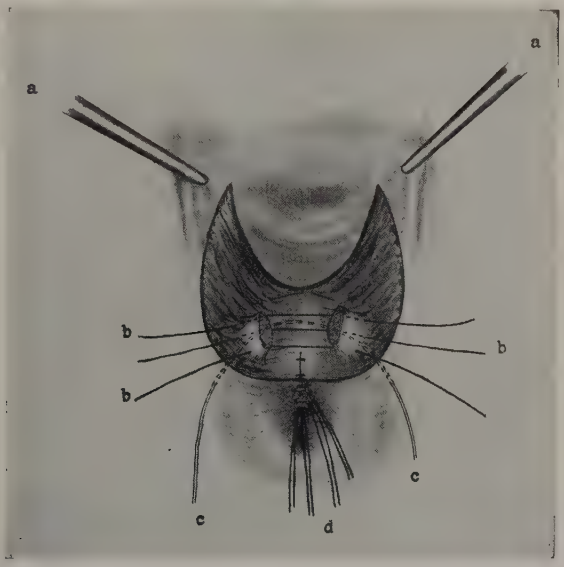


Fig. 5421.—The Same _ III: _ c, c, Deeply placed silkworm relaxation suture passing through the substance of the sphincter muscle; _ b, b, chromic catgut sutures to coaptate the freshened ends of the sphincter; _ d, ends of the rectal sutures protruding through the anus.

left long and temporarily used, in turn, as tractors, while the next stitch is being placed (v. Fig. 5419, **ee, ff, gg,** _ where all are shown placed before any are tied). Every alternate one of these sutures may be of silkworm _ in which case the catgut stitches are cut short and the silkworm left long and are brought out through the anus. The completely sutured rectal wall with tied sutures emerging from the anus is seen in Fig. 5420.

The retracted torn ends of the sphincter are now freed by dissection, with forceps and scissors, guided to their site by the slight depression over them (v. Fig. 5419, **d, d**) _ and their ends are then seized with forceps and brought sufficiently into the wound to both stretch them (sufficiently for easy approximation) and to enable their ends, covered with scar tissue, to be transversely excised (v. Fig. 5420, **b, d**). Before attempting to unite the ends of the sphincter a deep silkworm relaxation suture should be passed _ which should enter the skin about 5 mm. (3/16 inch) from the margin of the anal wound _ pass through the sphincter muscle of one side, while under

tension, at about 7 mm. (5/16 inch) from its end – pierce that side of the rectovaginal septum – and, emerging into the pelvic wound, repeat the excursion upon the other side in the opposite direction (Fig. 5421, **c, c**). This tension-taking suture is left temporarily untied. The trimmed ends of the torn sphincter are now brought together by two or three No. 1 chromic catgut sutures passing through the entire thickness of the cut ends (v. Fig. 5421, **b, b, b**). Simple or mattress-sutures may be here used – but strain should be taken off the parts during the tying of the stitches – and, subsequently, kept away from the muscle by the relaxation suture. The fully sutured sphincter, as well as the sutured rectal wall, are seen in Fig. 5422, where the

Fig. 5422.—The Same – IV; – The repaired sphincter is seen: **h**, Rectal sutures emerging from the anus; – **g**, superficial perineal stitches; – **ff**, relaxation sphincter suture; – **i**, deep buried chromic catgut sutures, approximating the borders of the levator ani and deep pelvic fascia; – **d, d** and **e, e**, silkworm sutures passing from the surface through the deep structures of the pelvic musculofibrous sling; – **b, c**, sutures closing the upper part of one of the lateral triangles.

tension-taking stitch is not yet tied. A second silkworm relaxation suture is sometimes carried through the sphincter. The margins of the levator ani and the deep pelvic connective tissue are brought together by several buried chromic catgut stitches (v. Fig. 5422, **d**). Two or three silkworm sutures are also carried through the skin margins and through the deeper musculofibrous structures of the pelvic sling (v. Fig. 5422, **d, d** and **e, e**). Superficial and half-depth catgut stitches are placed in the intervals. The finally sutured wound is seen in Fig. 5423.

As a rule the sutures which close the upper lateral vaginal triangles are placed first.

In those cases in which the laceration extends up the rectal wall high enough to involve the internal sphincter some of the silkworm sutures, passed

Fig. 5423.—The Same _ V; _ The fully sutured wound _ the silkworm sutures are left long

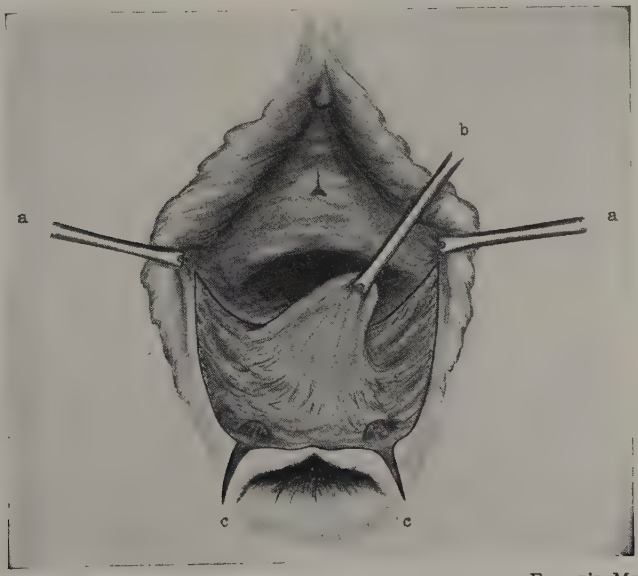


Fig. 5424.—Operation for Vagino-perineo-rectal Laceration by Emmet's Mediobilateral Denudation of the Main Wound _ and by the Warren-Kelly "Apron Method" of Repairing the Sphincter Ani and Rectal Wall _ I; _ The usual mediobilateral vaginoperineal denudation has been performed _ except that the lower limit of the denudation has been kept somewhat more horizontal and slightly further above the perineo-anal margin _ for the purpose of furnishing a perineo-anal "apron" for the protection of the rectal outlet.

from the perineal skin, should attempt to catch up the retracted ends of the internal sphincter on each side of the deep wound.

In about 5 per cent of cases Noble states that infection from the rectum is to be expected.

Operation for Vagino-perineo-rectal Laceration By Emmet's Mediobilateral Denudation of the Main Wound – and by the Warren-Kelly "Apron Method" of Repairing the Sphincter Ani and Rectal Wall.— As in the technic just described, the portion of the technic dealing with the vaginoperineal portion of the laceration and relaxation, is the same as that described, in detail, under the repair of simple vaginoperineal laceration

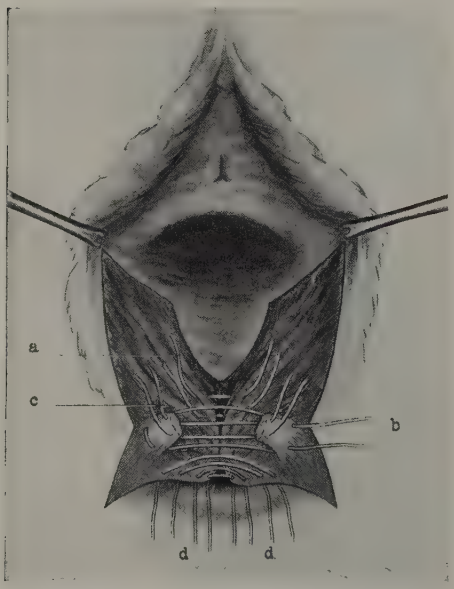


Fig. 5425.—The Same – II; – The perineo-anal or perineorectal "apron" (according to the amount of tissue supplied by anal orifice or rectal wall) has been mobilized and turned down – and sutures (none of which enter the rectum) placed in the margins which, until the apron was everted, were uppermost. The torn and retracted ends of the sphincter have been dissected out, delivered into the wound, and their covering scar tissue excised, after which a relaxation mattress-suture, **b**, has been placed and two terminal coaptation sutures, **c**. The margins of the levatores ani are being brought together by buried sutures, **a**. In the final position of the sutured wound the stitches, **d, d,** will be turned forward.

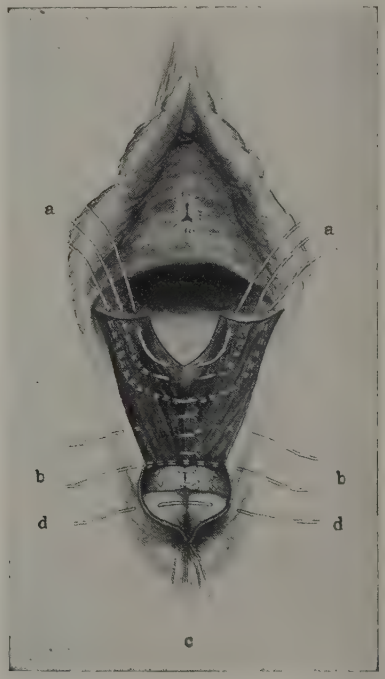


Fig. 5426.—The Same – III; – The sphincter ani has been repaired – the margins of the levatores ani brought together by buried sutures – the lower face of the "apron" united by sutures, and others placed, ready to continue the marginal union, **d, d.** Marginal perineal sutures are seen at **b, b.** The upper lateral triangles are being closed by sutures, **aa ,aa.**

(v. p. 209) – and this will not be further described here. The apron method of dealing with the perineorectal margin is, in reality, a flap-splitting method – very largely resembling that already described under the flap-splitting technic of repairing these lesions (v. p. 201) – and exactly resembling it if the lateral cut be added to the outer limits of the "apron."

The great practical feature of advantage of this method over that of any other in which the rectal tear is repaired by sutures introduced from the side of the rectal mucosa is that, in the present method, the sutures are

introduced from the raw surface of the wound, and none penetrate the rectal wall — so that chance for infection from this source is very much lessened.

The bilateral denudation of the upper portion of the vaginal tract is carried out as described under the repair of simple vaginoperineal laceration. In making the median perineal portion of the denudation the lower part of the incision is made somewhat more horizontal — and, at the same time, slightly further above the free perineorectal margin (Fig. 5424) — these steps being taken to provide sufficient perineo-anal tissue to be turned down as an apron. To one accustomed to locating and delivering the torn and retracted ends of the sphincter ani this incision usually suffices for the finding, dissecting, and bringing the ends of the sphincter into the wound, especially after

Fig. 5427.—The Same — IV; — The completely closed wound. The medially sutured margins of the apron — and the relaxation sphincter suture are seen.

Fig. 5428.—Repair of the Lacerated Sphincter Ani Muscle Alone: — a, Interrupted buried sutures of the ruptured internal sphincters; — b, b, skin sutures. The relaxation sutures available are shown in Fig. 5427.

the apron has been turned down — but, in those cases in which it does not, the two short oblique incisions may be made downward and outward from the main wound, over the two lateral "dimples," as in the method described under the flap-splitting operation, p. 201, and as shown by the dotted lines in the last quoted illustration. The addition of these two oblique incisions adds slightly to the complication in the subsequent suturing.

It is desirable to turn down an apron sufficiently fleshy to insure its own nourishment, as sloughing of the flap has sometimes occurred because of lack of vascularity in the part. When the flap has been dissected and everted, the ends of the sphincter are dissected, delivered into the wound, and the scar tissue cut from their ends — which are then brought together by combined direct and relaxation suture (Fig. 6425, **b** and **c**). Instead of passing a relaxa-

tion suture in the open wound, a silkworm relaxation suture may be passed deeply, from the perineal surface, passing through the sphincter muscle, at some distance from their free ends.

The general vaginal and perineal denudations, and the suturings of both of these aspects of the wound, are conducted as in the simple vaginoperineal operations. Usually the upper lateral triangles and the perineal areas are first denuded _ then the upper portion of the upper lateral triangles are closed _ then the torn rectal wall and sphincter are repaired _ and, finally, the median portion of the wound is closed. But this order may be varied.

The margins of the sides of the perineorectal apron are brought together in the median line by fine catgut sutures, none of which enter the rectal mucosa (Fig. 6426, c).

The completely sutured wound is shown in Fig. 6427.

Repair of Ruptured Sphincter Ani Alone _ Kelly.—It sometimes happens, following the technical procedure of repairing a lacerated and relaxed perineum, that while the vaginoperineal portion of the operation may have accomplished its purpose, there remains lack of satisfactory control of the sphincter ani. Under such circumstances Kelly has exposed the sphincter by a semilunar perineal incision just above the anus _ through which he has turned down a narrow perineo-anal "apron" of overlying skin and fascia _ dissected out the torn and retracted ends of the sphincter _ and united them in exactly the same manner as when this part of the technic is performed as a part of the original and more elaborate procedure. It is well to stretch the sphincter and anal orifice in advance, so that the otherwise shortened sphincter will be long enough for satisfactory manipulation. The ends of the sphincter may either be directly united by No. 1 chromic catgut suture, as shown in Fig. 5428 _ after which a relaxation suture of silkworm filament is placed through the skin and through both ends of the immediate sutures, to the outer sides of these. Or one may place in position a relaxation suture of the mattress type loosely _ then place and tie the immediate or terminal sutures _ and finally tighten the mattress-suture (v. Fig. 5426). When the outside silkworm relaxation suture is used its position is as has been already shown (v. Figs. 6421 and 6422). Following the operation the bowels are either moved on the third day, following the use of compound licorice powder _ or, as preferred by Kelly, the patient is put upon albumen-water for eight or ten days _ following which 2 drams of compound licorice powder are given overnight, followed the next morning by an oil enema.

OPERATION FOR VAGINOPERINEAL LACERATION AND RELAXATION

BY MEDIAN DENUDATION

Description.—As a third general type of procedure in the repair of vaginoperineal laceration and relaxation may be taken the various methods by median denudation _ in which an area of the vaginoperineal tract is denuded, the center of the denudation corresponding with the median vaginoperineal line, and the shape generally being some modification of a lozenge, triangle, or shield, the longest measurement of which will correspond with the median axis.

As in all the methods of denudation, the mucocutaneous covering of the denuded area is discarded _ in contradistinction to the flap-splitting methods, in which no tissue is lost.

The methods of the simple median denudation seem to be applied to the simpler and more minor grades of laceration and relaxation and to those of the vaginoperineal tissues, rather than to complete vagino-perineo-rectal lesions _ although there is no fixed rule in the matter.

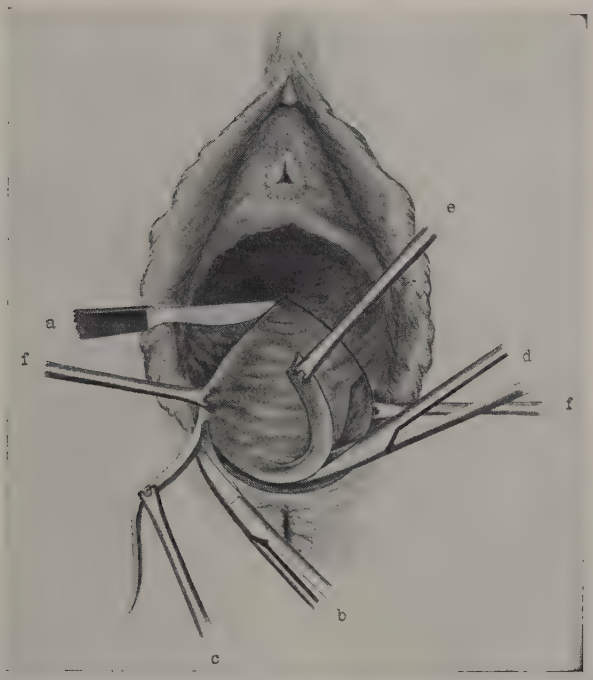


Fig 5429.—Illustrating Various Stages in the Process of Vaginoperineal Median Denudation; _ Outlining the area by knife and removing the mucosa by scissors in strips.

Fig. 5430.—Hegar's Vaginoperineorrhaphy _ I: _ a, a, Sutures ready to approximate the vaginal portion or denudation of a superficial laceration; _ b, b, those for restoring the perineal face of the wound; _ c, c, the crown stitch at the vaginoperineal junction.

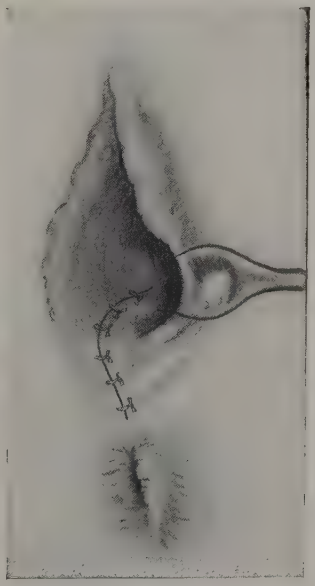


Fig. 5431.—The Same _ II; _ The sutured wound

All of the preparatory, concomitant and postoperative measures which hold in the more major procedures hold here – as to kind, even if different in degree.

The general method of accomplishing the denudation of the vaginoperineal tract is shown in Fig. 5429 – and has also been illustrated in the preceding technics.

The application of the methods of median denudation will be sufficiently described by the technics of Hegar and Holden.

Hegar's Vaginoperineorrhaphy.—In the simplest forms of superficial laceration the area from which the mucocutaneous tissue is to be excised is steadied by tenaculum forceps placed just outside of this area – which is then excised, usually in triangular form (Fig. 5430). Sutures are then passed through the margins and beneath the raw surfaces – which are thereby every-

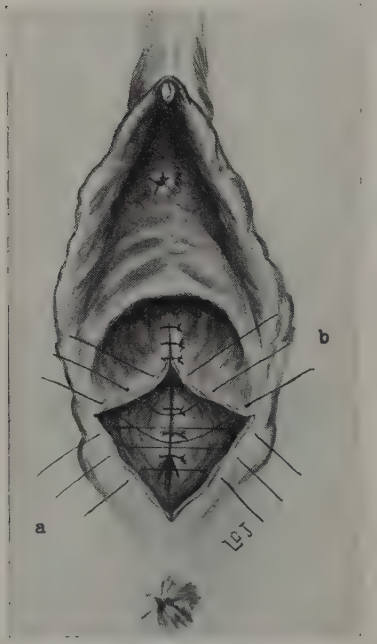


Fig. 5432.—Vaginoperineorrhaphy of an Intermediate Grade – necessitating buried and superficial sutures.

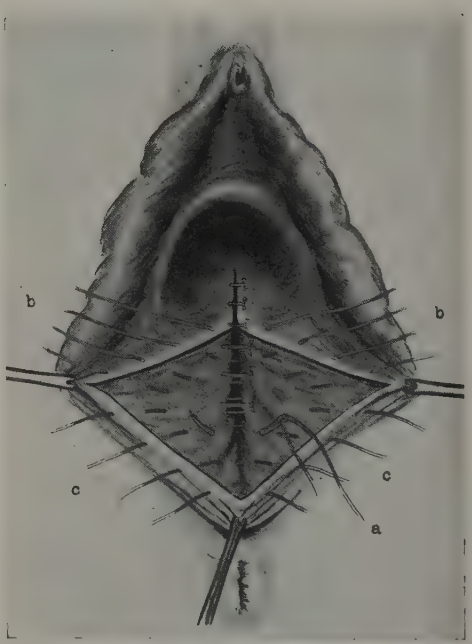


Fig. 5433.—Vaginoperineorrhaphy Involving Considerable Superficial Area, but Without Involving or Exposing the Deeper Pelvic Structures.

where gathered up and brought together when they are tied. Usually one set of sutures, **a**, will unite the vaginal margins . another, **b**, the perineal margins – and a crown stitch, **c**, the area of vaginoperineal junction. The sutured wound is seen in Fig. 5431.

Where a more marked type of involvement is present and the deeper pelvic fascia and muscle sling are included in the rupture, the separated margins of the levatores ani and the pelvic fascia are first brought together by buried chromic catgut sutures – after which the superficial parts are sutured together over the approximated deeper parts (Fig. 5432). The placing of buried and superficial stitches is further shown in Fig. 5433.

Holden's Vaginoperineorrhaphy.—This technic is planned to build up an especially firm and resistant pelvic floor. A triangular denudation of the vaginoperineal tract is made (Fig. 5434) the uppermost limit of the de-

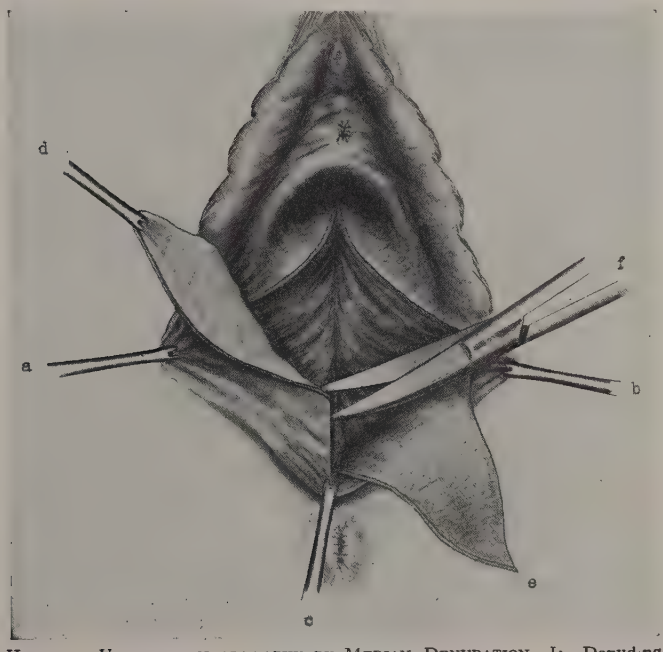


Fig. 5434.—Holden's Vaginoperineorrhaphy by Median Denudation.—I.—Denuding the vaginoperineal tract.

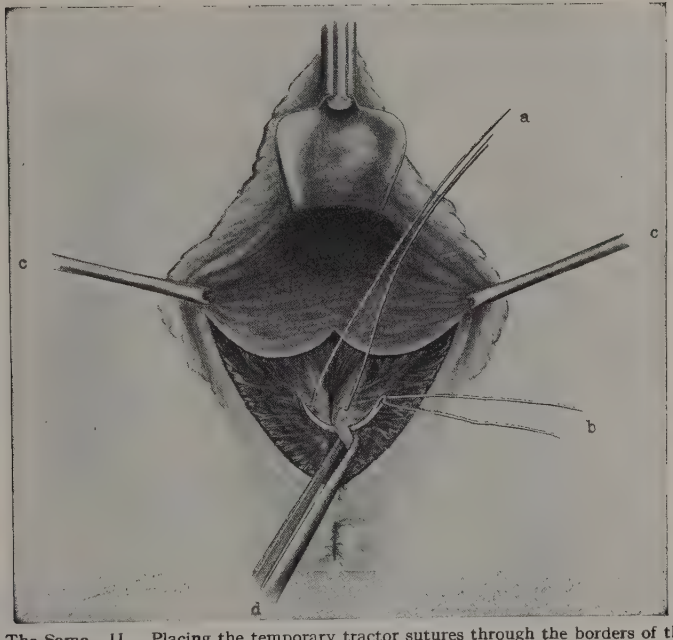


Fig. 5435.—The Same.—II.—Placing the temporary tractor sutures through the borders of the levatores ani.

nudation being from 4 to 6 cm.—$1\frac{9}{16}$–$2\frac{6}{16}$ inch) above the vaginal outlet. The separated borders of the levatores ani are first palpated, and are then

Fig 5436.—The Same – III: – c, c, Silkworm sutures passing through the wound margins and the borders of the levatores ani muscles; – a, a, and b, b, figure-of-eight silkworm sutures lacing together the levatores ani and approximating them to the vaginal mucosa; – sutures uniting the median apex of the wound are shown unlettered.

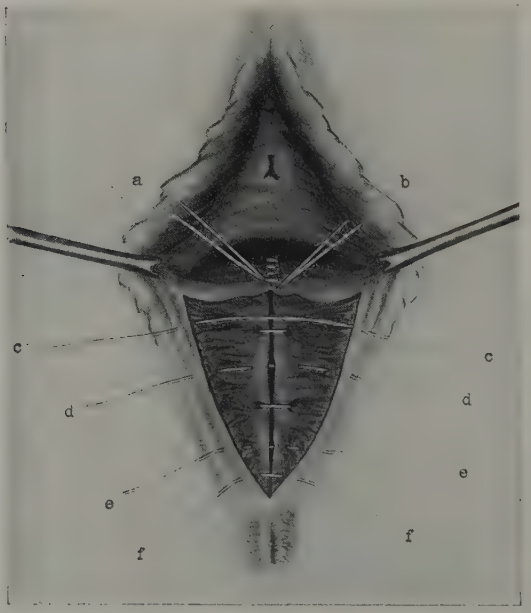


Fig. 5437.—The Same – IV: – a and b, The tied figure-of-eight sutures; – d, e, the still untied deep silkworm sutures; – f, f, and c, c, intermediate superficial sutures – of which others will be placed in the vaginal floor.

seized by forceps in turn, and brought mediad, where each is pierced by a temporary tractor ligature, by which they are manipulated in the subsequent steps of the operation (Fig. 5435). Three sets of sutures are then placed –

which are more easily pictured than described _ the effect of which is to snugly coaptate and lace the parts firmly and solidly together. Two sutures **cc, cc,** Fig. 5436, of silkworm filament, are carried through the margins just outside of the denudation _ then through the full thickness of each levator ani as it is held forward, in turn, by the temporary tractor ligatures _ and out just beyond the opposite margin of denudation. The rectum is depressed while these sutures are being passed. These two stitches are left loose temporarily after being placed _ and the temporary tractors are removed. The highest, most superficial, median stitches of catgut (not lettered in the picture)

Fig. 5438.—The Same _ V; _ The fully sutured wound _ and the restored vaginoperineal outlet.

are next taken. Two figure-of-eight sutures, of silkworm filament or of formalinized catgut, are next placed _ in the manner shown by stitches **b, b** and **a, a** _ which bring together the levators, and pelvic fascia, just as corset-lacing acts, and also approximate them to the vaginal mucosa _ and emerge upon the upper vaginal floor. The tying of these reconstruct the posterior aspect of the perineal body. Then the two temporarily left loose silkworm sutures are tied _ completing the anterior portion of the perineal body. Finally, superficial and half-depth marginal sutures are inserted as indicated (Fig. 5437), the wound when finally sutured presenting the appearance shown in Fig. 5438.

CHAPTER LXXXVII

INTRAVAGINAL OPERATIONS UPON THE CERVIX UTERI AND UPON THE CAVITY AND BODY OF THE UTERUS

Surgical anatomy of the cervix uteri and vagina, p. 230.

Series of frequently employed gynecologic technics, p. 230; _ Examination of the uterine cavity and cervical canal by the passage of uterine sound or endoscope, p. 230; _ Dilatation of the cervical canal, p. 233; _ Curetage of the cervical canal, p. 240; _ Curetage of the cervical canal and uterine cavity, p 240; _ Irrigation of the uterine cavity and cervical canal, p. 246; _ Making applications to the walls of the cervical canal and uterine cavity, p. 247; _ Packing the uterine cavity and cervical canal, p. 248.

Securing endocervical and uterine scrapings and cervical tissue for examination, p. 251; _ Digital examination of the dilated cervico-uterine canal, p. 252; _ Digital examination of the uterine cavity through the incised cervico-uterine canal, p. 253.

Operative treatment of erosion of the cervix uteri, p. 255; _ Operation for traumatic or pathologic occlusion of the cervical canal, p. 256; _ Trachelotomy, tracheloplasty, and excision of the os externum and adjacent endocervical mucosa for constriction of the cervical opening, p. 257.

Operations for laceration of the cervix uteri (trachelorrhaphy), p. 263.

Intravaginal operations for anteflexion of the uterus, p. 271; _ Operation for uterine retroflexion, by uteroplastic technic, through an anterior vaginoperitoneotomy incision (Doyen), p. 275; _ Operation for uterine retroflexion by uteroplastic technic through an anterior vaginoperitoneotomy incision (Reed), p. 275.

Removal of tumors of the uterus by the vaginal route, p. 276; _ Palliative measures in cancer of the cervix uteri, p. 293.

Amputations of the cervix uteri, in general, p. 296; _ Intravaginal partial amputation of the cervix uteri by Schroeder's single flap method, p. 297; _ Intravaginal partial amputation of the cervix uteri by Markwald's double-flap method, p. 302; _ Intravaginal partial amputation of the cervix uteri by circular section, p. 306; _ Other forms of intravaginal amputation of the cervix uteri, p. 311.

SURGICAL ANATOMY OF THE CERVIX UTERI AND VAGINA

For the Anatomy of the Cervix Uteri, see Anatomy of Uterus (v. Index).*
For the Anatomy of the Vagina, see p. 154.

SERIES OF FREQUENTLY EMPLOYED GYNECOLOGIC TECHNICS

Examination of the uterine cavity and cervical canal by the passage of uterine sound and endoscope _ Dilatation of the cervical canal _ Curetage of _ Irrigation of _ Applications to _ and Packing of the uterine cavity and cervical canal _ are progressive steps so often carried out in the routine of gynecologic work, either as individual undertakings or as associated parts of combined operations, that each of these technical procedures will be described in turn.

EXAMINATION OF THE UTERINE CAVITY AND CERVICAL CANAL BY THE PASSAGE OF UTERINE SOUND OR ENDOSCOPE

The most commonly employed instrument for the examination of the canal of the cervix and the cavity of the uterus is the uterine sound (Fig. 5439). Its chief use is for determining the direction and the depth of the cervico-uterine canal (and, thereby, the size of the uterus) _ and, as a determiner, through its rigidity, of the general uterocervical axis. It is also used, with almost equal frequency, for determining the degree of contraction, if any, of the cervico-uterine canal _ and for estimating the presence or absence of abnormal obstructions in this twofold canal. A digital intravaginal ex-

amination and a bimanual estimate of the position of the uterus usually precede the introduction of the sound.

It is especially important that all question of pregnancy be ruled out, as its introduction without suspecting this condition (and often wilfully deceived

Fig. 5439.—Spiegelberg's Graduated Uterine Sound.

by the patient) is due to cause abortion. Its use is also generally contraindicated if infection or malignancy of the uterus or infection of the tubes be present _ and also if there be infection of the vagina, for its course through the latter would be apt to involve the uterine cavity.

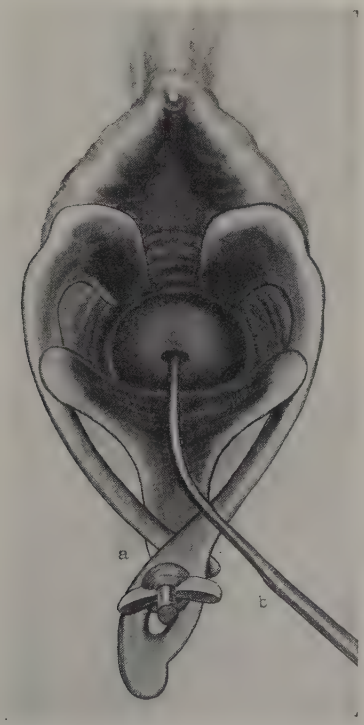


Fig. 5440.—Introduction of a Uterine Sound Through a Trivalve Speculum. The sound is being entered from one side and will be swung into the median line.

The sound is usually introduced with the patient in the dorsal gynecologic posture and after the introduction of a bivalve speculum. While the precaution is not systematically observed, it is technically safer to first paint the cervical opening of the uterine canal and the cervical canal itself, if it be sufficiently patulous, with the tincture of iodin, for the purpose of disinfection

before passing the sound – and then to avoid letting any portion of the sound, sterilized by boiling, touch any part of the vulval or vaginal tract in making its entry into the cervico-uterine canal.

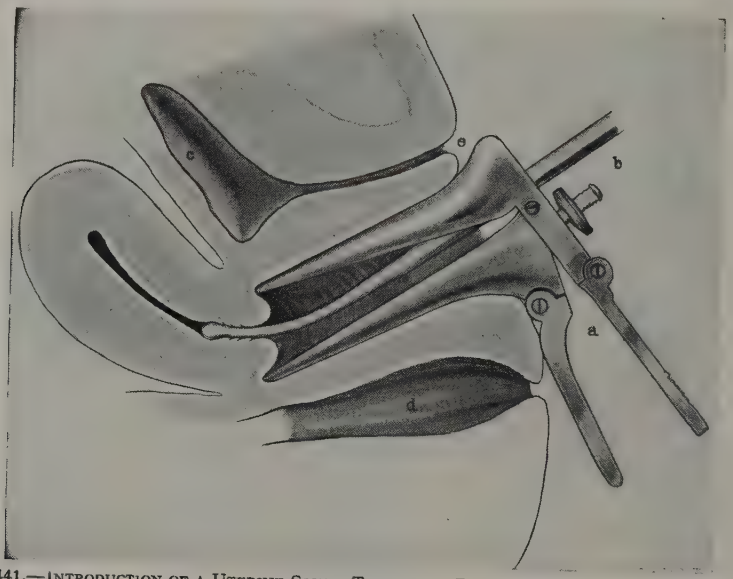


Fig. 5441.—Introduction of a Uterine Sound Through a Bivalve Speculum – seen in profile.

Figs. 5442 and 5443.—David's Hysteroscope: – a, Obturator and tube; – b, inner tube with lenses and current connections.

The sound, if it be known in advance, by examination or otherwise, that the organ is posteriorly or laterally deflected or bent from its normal position, is correspondingly bent before introduction – otherwise it is usually intro-

duced with its convexity directed downward and its tip slightly upward (Fig. 5440). As the sound is carefully passed inward its handle is slightly lowered (when the parts are normal), so that its curvature will correspond with that of the cervico-uterine axis (Fig. 5441). At no period of the manipulation should the slightest force be used either in the axis of the instrument or laterally _ for the uterine wall has been frequently punctured _ a fact sometimes not disclosed until the *postmortem*. If the cervico-uterine axis be normal, and the sound be bent to correspond with it, it is usually not possible to sweep the sound through a lateral revolution within the uterus _ though if there be departures from the normal, and the sound be bent less than usual from the normal curvature, it will often be possible to sweep its end through a complete circle while it is within the uterus and without causing the patient discomfort. At the completion of the examination the sound is carefully withdrawn by reversing the manipulation by which it was introduced.

The examining sound may also be introduced with the patient in Sims' position.

The cervico-uterine canal is also sometimes examined by means of direct electric illumination through a uteroscope or hysteroscope (Figs. 5442 and 5443).

DILATATION OF THE CERVICAL CANAL

Description.—The stretching or distention of the canal of the cervix uteri. The object is to dilate or stretch _ not tear _ the cervical canal. The limit of dilatation beyond which one should not expect to be able to go without some tearing of tissues is often stated to be about 1 cm. (6/16 inch). Where the dilatation is performed for the purpose of making a digital examination of the walls of the cervical canal and uterine cavity, while the uterus is steadied from without by the pressure of the other hand through the abdominal wall, the dilatation then must, of course, be carried, whether by the dilating instrument or reinforced by the finger, up to the extent of admitting the second joint of the index-finger of the individual Surgeon.

It is to be understood that the dilatation is of the cervical canal _ no active, intentional dilatation of the uterine cavity being carried out. The distal end of the dilating instrument, whether by the gradual or rapid method, will project into the uterine cavity, but the blades of all dilating instruments should open parallel throughout their entire length (which prevents their distal ends from separating any further than do the proximal ends) _ and there is no occasion to carry them into the uterine cavity any further than to well engage the internal os uteri. It is very true that one often sees dilators carried through the cervical canal and on into the uterine cavity until they are stopped by their abrupt shoulders against the face of the cervix, and their tips against the uterine wall of the fundus _ but it is the dilatation of the cervical canal rather than the uterine cavity which should be sought. In spite of this there must, of mechanical necessity, be some degree of dilatation of the common cervicouterine canal.

It should always be remembered that many deaths have occurred from rupture of the uterus (often not discovered until at the *postmortem*) _ by both gradual and rapid dilatation.

Indications for Dilatation of the Cervical Canal.—For the purpose of securing access in order to examine the cervical canal itself and the uterine cavity beyond; _ To secure the entry of instruments into the cervical and uterine cavities for operations thereon (as in curetage and in the removal of tumors); _ For the purpose of being able to make applications to the cervical and uterine mucosa: _ For the therapeutic effect of dilation (the exact *modus*

operandi of which is not understood) in some forms of dysmenorrhea; – To overcome sterility; – As a preliminary, or as the sole means of emptying the uterus of the products of conception (*i. e.*, to produce abortion or miscarriage); – As a preliminary to the destruction of a child not capable of being normally delivered.

Contraindications to Dilatation of the Cervical Canal.—Active inflammation, or infection of the uterine or para-uterine tissues; – acute intrapelvic disease; – pyosalpinx; – pelvic abscess; – pregnancy (unless it be to

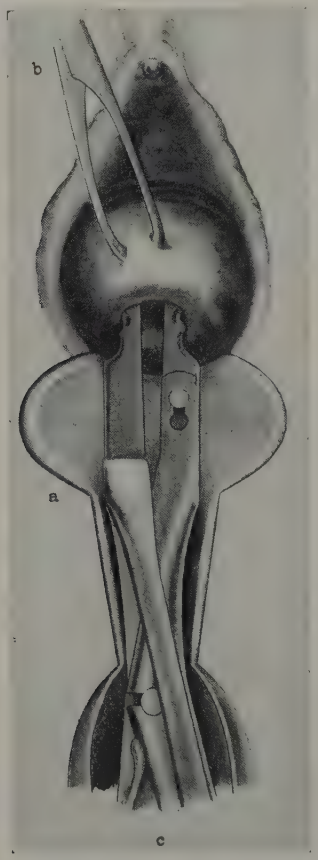


Fig. 5444.—Instrumental Dilatation of the Cervical Canal – I: – **a**, Weighted posterior vaginal speculum in position; – **b**, the cervix uteri steadied by tenaculum forceps; – **c**, Goodell-Ellinger dilator in the act of dilating the canal – its blades being in a horizontal position.

intentionally empty the uterus); – extra-uterine pregnancy; – uterine malignancy; – old age (unless with great care). In some of these conditions dilatation may be warrantable, provided an operation is planned to immediately follow for the relief of the main or accompanying condition.

Methods of Dilatation.—(1) Rapid dilatation by means of metallic dilators with movable blades; – (2) Rapid dilatation by means of increasing sizes of hard dilators of fixed caliber; – (3) Combined rapid dilatation with fixed and movable dilators; – (4) Gradual dilatation by means of soft or semisoft expansible tents; – (5) Combined gradual and rapid dilatation.

Much controversy has been called forth upon the choice of method for dilating the cervical canal – the various phases of which will not be gone into here. Briefly, the status may be summarized as follows: – Rapid dilatation is the method most frequently performed at the present time. Laceration is more apt to occur in connection with rapid dilatation. Infection is more apt to occur in connection with gradual dilatation. Some Surgeons prefer to

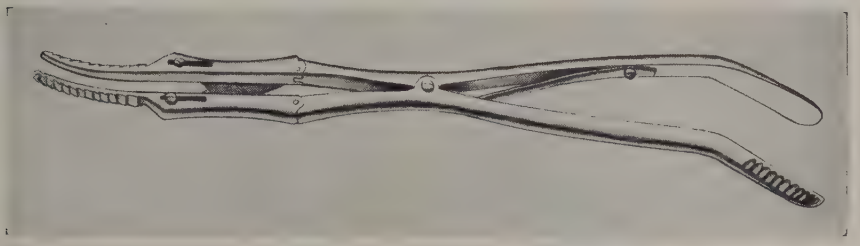


Fig. 5445.—Goodell-Ellinger Cervical Dilator. (Redrawn from Kelly.)

variously combine gradual and rapid dilatation. The technic which is probably the best and most frequently employed is to resort to a form of combined dilation, – conducted at one séance, in which the cervical canal is first dilated by increasing sizes of such fixed-calibered dilators as Hegar's, followed, immediately, by rapid dilatation with an expanding-bladed dilator.

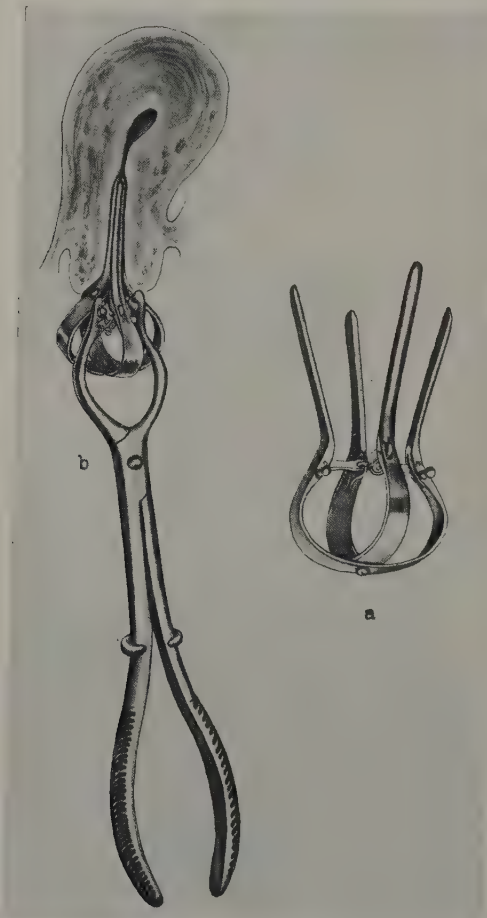
Fig. 5446.—The Same – II; – The technic of dilation is seen in sectional view – with the blades being separated in the vertical axis

As may be inferred from the various indications, dilatation of the cervical canal is not necessarily followed by curetage of the cervical or cervico-uterine canal – though, with the majority of Surgeons, curetage is preceded, as a routine, by dilatation. However, some noted Gynecologists systematically curet without previous dilatation.

The usual antisepticising preparations made for gynecologic operations in general (v. p. 124) should be employed in advance of dilatation – which

should not be performed in the office – and which should be followed by temporary confinement to bed. Dilatation should always be preceded by the bimanual determination, and determination by sound, of the position of the uterus and the axis of the cervico-uterine canal. Anesthesia is employed.

Rapid Dilatation by Means of Metallic Dilators with Movable Blades.—The patient is placed in the dorsal gynecologic posture, and a weighted vaginal speculum introduced (Fig. 5444). The cervix is seized with tenaculum forceps, held by an Assistant, and by means of them the uterus is



Figs. 5447 and 5448.—The Metranoikter: – a, The expanded instrument; – b, introduction of the closed blades into the cervico-uterine canal.

both brought further downward and forward and also steadied during the manipulation. It is useless and wrong to try to drag the cervix to the vaginal outlet as sometimes seen. The cervico-uterine canal is often swabbed out with the tincture of iodin as a preliminary – (instruments which come into contact with iodin should be immediately washed). Tenacious mucus is removed by a cotton applicator dipped into a strong solution of bicarbonate of soda. When all is ready for the dilatation the axis of the cervico-uterine canal should be again ascertained by means of the sound. Preliminarily to

using the main dilator, the cervical canal must usually be opened up with some smaller instrument. The usual routine is to first introduce the uterine sound – then either the blades of a pair of curved uterine dressing-forceps – or, more technically, a metallic dilator of the same pattern, but smaller size than the main dilator – and when this has sufficiently prepared the way some such major form of cervical dilator as that shown in Fig. 5445, with serrated blades which never depart from the parallel, is carried into and through the cervical portion of the cervico-uterine canal – but while their points enter the uterine portion of this canal they should only do so very limitedly, as dilatation of the cervical portion is all that is sought. The blades are first introduced so that they will open in a horizontal plane – and in this plane they should be very slowly, gradually, and carefully separated – using no marked force, and taking no chance at rupturing the cervical tissues – and especially guarding against doing damage to the body of the uterus. The blades should

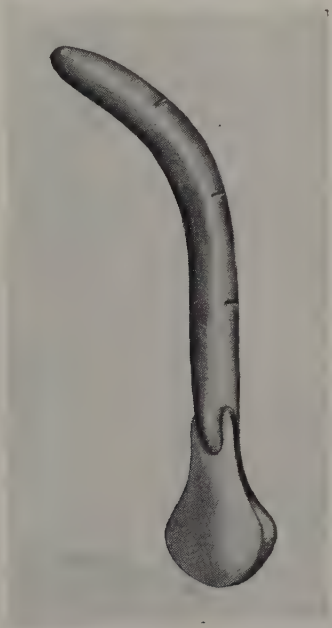


Fig. 5449.—Hegar's Dilator of the Cervical Canal.

be opened partly and held at this separation temporarily – before being further separated. It is well to select a dilator with a safety-stop attachment or, at least, a scale – which will either limit the amount of separation possible, as predetermined, or show the amount of dilatation accomplished at each stage – (neither of which devices being shown upon the accompanying instrument). At intervals the dilator is shifted so that the blades will act in a vertical axis – as in Fig. 5446 – and are then shifted back to the horizontal. In this way all parts of the circumference of the canal are equally subjected to pressure – and opportunity is given the tissues to stretch gradually. Dilatation up to from 1.2 to 2 cm. ($\frac{1}{2}$–13/16 inch) is carried out by many Operators as a routine – and sometimes even a greater distention – but extreme distention is both unnecessary and dangerous.

Occasionally dilatation is accomplished by the metranoikter (Figs. 5447 and 5448).

Rapid Dilatation by Means of Increasing Sizes of Hard Dilators of Fixed Caliber.—This is accomplished by means of dilators made of metal (solid or hollow) or hard rubber, of increasing sizes. The Hegar type of instrument, of which there are 26 sizes, ranging from 1 to 26 mm. ($\frac{1}{25}$–$1\frac{1}{25}$ inch) in diameter, is shown in Fig. 5449. A more convenient form of the dilator is a somewhat longer instrument, the opposite ends representing different sizes. Some sets of dilators represent as many as 35 sizes – a needless number, it would seem.

The preliminaries to dilatation by this method are the same as just described. The smallest size dilator which will pass through the cervical canal is first used – steadying the cervix with tenaculum forceps during its passage. The

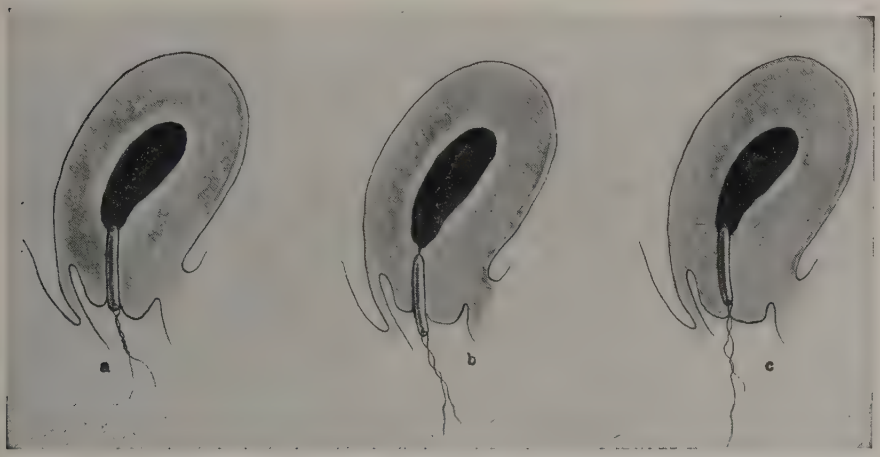
Fig. 5450.—Introduction of a Laminaria Tent Into the Cervical Canal. – a, Posterior vaginal retractor; – b, tractor of the anterior lip of the cervix uteri; – c, forceps in the act of placing a tent in the cervical canal

chief resistance experienced is at the internal os, but with a foreknowledge of the axis of the canal this is usually overcome by moderate light pressure. If a spasm of the internal os grips the dilator upon attempting to withdraw it, the instrument should not be tugged upon – the spasm will usually have subsided within a minute or two. Succeeding sizes are then passed. Each succeeding dilator should not be more than 1 mm. (1/25 inch) larger than its predecessor. The dilatation is sometimes carried on up to a 12 mm. size ($\frac{1}{2}$ inch) for curetage – up to 2 cm. (9/16 inch), for introduction of the finger – and up to 2.5 cm. (1 inch), for operative maneuvers within the uterus, such as the removal of tumors.

After extreme dilatation of the cervico-uterine canal it is well to temporarily pack the canal with a strip of sterile gauze. The patient is put to bed.

Combined Rapid Dilatation with Fixed and Movable Dilators.—This combination method is probably the most frequently employed. The cervical canal is first dilated with the smaller sizes of the Hegar dilator or its equivalent _ after which the Goodell-Ellinger instrument is employed for the rest of the dilatation, used in the same manner as when the bibladed method of dilatation alone is chosen. Again, one may begin with the Hegar dilators _ then shift to the Goodell-Ellinger _ and back and forth, in alternation, between the single-limbed and bibladed dilator _ until the requisite dilatation is accomplished.

Gradual Dilatation by Means of Soft or Semisoft Expansible Tents.—The varieties of tents which were most frequently employed were those made of laminaria digitata, or sea-tangle, known as laminaria tents _ those made of compressed sponge _ and the tupelo, or tupola tents, made of the nyssa uniflora tree. Dilatation by gauze packing has also been employed.



Figs. 5451–5453.—Positions of Laminaria Tent in the Act of Dilating the Cervical Canal: _ a, Properly engaged in all of the canal and in both external and internal ossa; _ b, improperly engaged in part of the canal and in external os; _ c, incorrectly engaged in part of the canal and in internal os.

The disasters following infection largely caused the great limitation in the present employment of this method of dilatation. Tents were chiefly used to dilate the cervical canal in order to produce miscarriage or abortion.

The same preliminaries are observed as in other methods of dilating the cervical canal. With the vagina dilated by speculum, the cervix seized, drawn down, and steadied by means of tenaculum forceps, the tent, of appropriate size, held in a special form of tent introducer or in uterine dressing forceps, is carried into the cervical canal so that one end projects beyond the internal and the other beyond the external os, where it is left _ the method of introduction being shown in Fig. 5450. The possible errors in the technic of introduction contrasted with the correct method are shown in Figs. 5451–5453. A tent accomplishes the extent of dilatation of which it is capable within from twelve to fifteen hours _ and is then withdrawn by the silk loop attached to its end _ or by forceps. It is usually firmly held by the internal os. Tents are best preserved in a 1 : 1000 alcoholic solution of bichlorid of mercury _ which should be rinsed off in sterile water before usage. When they are in

position the vagina is usually lightly packed with gauze – the patient remaining quietly in bed.

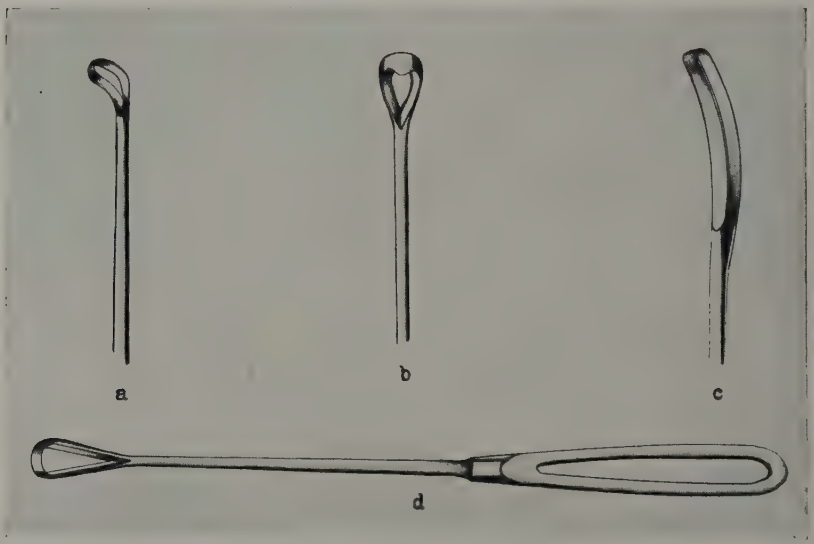
Combined Gradual and Rapid Dilatation.—This is the method of choice with some Operators. The basis of this is that the use of the tent has a remarkably softening effect upon the cervical tissues – and this fact is made use of preparatorily to the employment of instrumental dilatation. The tent is introduced over night – is removed in twelve hours – and the additional dilatation desired is accomplished by such an instrument as the Goodell-Ellinger dilator or the Hegar dilator.

CURETAGE OF THE CERVICAL CANAL

This will be described under Curetage of the Uterine Cavity and Cervical Canal (v. p. 240).

CURETAGE OF THE CERVICAL CANAL AND UTERINE CAVITY

Description.—The removal by curet through a process of scraping of the superficial aspect of the mucosa of the cervical canal and uterine cavity –



Figs. 5454–5457.—Sharp Curets: – a, Sims' sharp curet; – b, Winter's sharp angular curet; – c, curved knife curet; – d, elongated sharp curet.

or of growths or the products of conception. From the epithelium of the uterine glands left behind there is regeneration of the uterine mucosa. Curetage may be either of the cervical or uterine canal alone – or of both combined.

Forms of Instruments Employed in Curetment.—A variety of these is in use – which may be grouped under several main headings.

Sharp curets are seen in Figs. 5454–5457. These act by a modified form of cutting.

Dull curets are shown in Figs. 5458–5460. They act by a process of combined crushing and dragging.

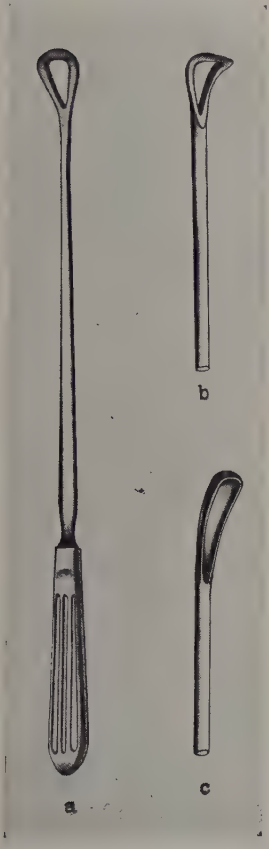
Serrated and dentated curets are illustrated in Figs. 5461–5464. Their action is intermediate between cutting and crushing.

Flushing curets – combining the features of any of the preceding varie-

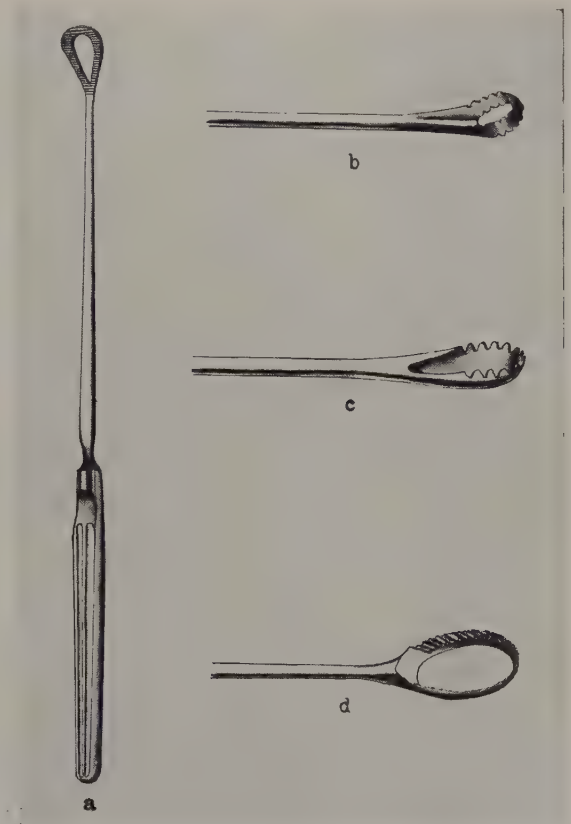
ties, with the power of flushing the cavity or canal – are shown in Figs. 5465–5467.

Miscellaneous types of cervical and uterine curets are shown in Figs. 5468–5472.

Indications for Curetage.—Endocervicitis; endometritis, removal of the retained products of conception, both to produce abortion and after birth of the child; securing of tissue for examination, sterility – hemorrhage, leukorrhea in some cases of otherwise inoperable malignancy.



Figs. 5458–5460.—Dull Curets: – a, Thomas'; – b, angular; – c, spoon.



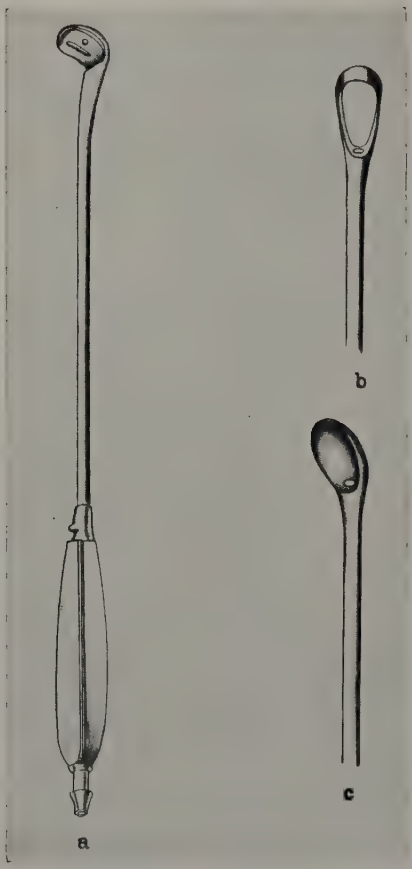
Figs. 5461–5464.—Serrated and Dentated Cervico-uterine Curets: – a, Greene's serrated; – b, Kelly-Sims' sharp, serrated, fenestrated; – c, Kelly's serrated spoon; – d, dentated, fenestrated.

Operative Technic.—Curetage is generally one of the steps of a series of frequently employed minor gynecologic procedures referred to at p. 230. It is usually immediately preceded by dilatation of the cervical canal just described (v. p. 233) – and is generally immediately followed by irrigation of the uterocervical canal (v. p. 246) – and by some form of application to the uterine cavity and cervical canal (v. p. 247) – and often by packing of the common cavity and canal (v. p. 248).

In the present instance it will be supposed that the patient has been carried through the stage of dilatation of the cervical canal by one of the rapid methods – though, as has been mentioned, some Gynecologists curet without

previous dilatation. Curetment of the cervical canal may alone be carried out without necessarily invading the uterine cavity. Curetage of the uterine cavity is rarely performed without also cureting the cervical canal, although it too may be alone cureted. The usual procedure is to first dilate the cervical canal _ then curet the uterine cavity _ and in the final stage of the operation also curet the cervical canal. The curetage of each separately will be here considered.

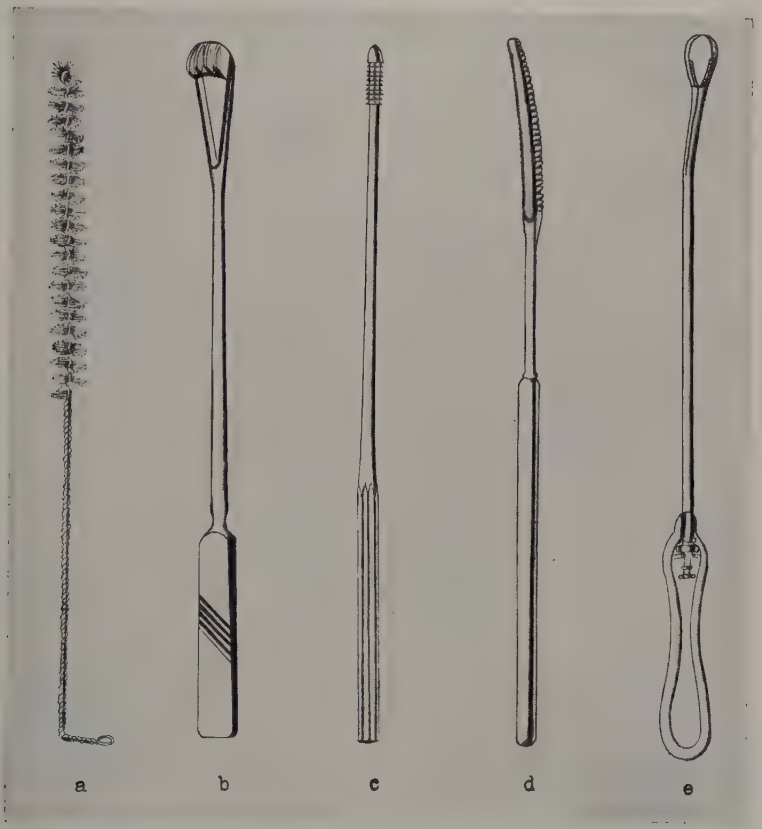
Curetage of the Cervical Canal.—In all forms of curetment it is well to seize the tissues of the cervix by some special form of tenaculum forceps,



Figs. 5465–5467.—Flushing Curets: _ a, Broad, dull flushing curet; _ b, Thomas' sharp flushing curet, _ c, flushing spoon curet.

and in such manner as to enable the parts to be steadied and brought sufficiently into the field for manipulation (without unnecessarily dragging the cervix or uterus too far out of the body) _ and it is especially necessary to do so in the case of cureting the cervical canal by some form of tractor which will not itself enter the canal and interfere with the cureting instrument. The cervical tissues, therefore, are best seized by means of double toothed tenaculum forceps, the teeth of which are placed at a right angle to the shafts of the instrument. The teeth should take a firm enough hold not to tear out _ and still not enter the canal. When this has been done, the special form of

curet is passed through the external os, up the dilated or otherwise patulous cervical canal, to its extreme upper end, or to just within the uterine aspect of the internal os. By successive axial excursions of the curet, from and including the internal os, to and including the external os – taking in the floor, roof, and lateral walls – the mucosa of the canal is thoroughly scraped from above downward – being careful to leave no strip or ribbon of unscraped mucosa, especially at the indefinite boundaries of floor, roof, and lateral walls. The grating sensation and sometimes sound of the edge of the curet passing over denuded tissue generally indicates that the muscular tissue has been



Figs. 5468–5472.—Special Forms of Cervico-uterine Curets: – a, Doléris' spiral uterine mop; – b, scarifying curet; – c, Olivier's cervix scraper; – d, file curet; – e, Bentuer's adjustable curet.

reached. A few spiral twists of the curet will usually enable all hitherto escaping islands of mucosa to be removed. All detritus in the way of scrapings, resulting from the curetage, are completely removed – either by curet or by a piece of gauze twisted upon an applicator.

If applications and a packing are to be used, these are carried out as described in these two operative procedures (v. pp. 247 and 248).

Curetage of the Uterine Cavity.—When both uterine cavity and cervical canal are to be cureted, curetage of the uterine cavity is first performed. While one of the lips of the cervix may be seized by clamp forceps, one blade of which may enter a short way into the cervical canal, if simple curetage of the corpus

uteri is to be performed, yet because curetment of both body and neck will be usually carried out, the grip of the cervix by an instrument whose blades do not invade the cervical canal is preferable – so that no later shift of instrument or change of hold may be needed. In order to prevent the too far downward traction of the uterus (which may, in consequence, remain down unduly long after the operation), it is well that the Assistant rests upon the pubis the hand which steadies the tractor.

The cervical canal is now usually dilated – and tincture of iodin may be applied to the cavity of the uterus. If thick, tenacious mucus block the way, this is best first removed by a cotton swab wet with bicarbonate of soda solution. A satisfactory form of curet is a sharp-bladed instrument with pliable or flexible handle – which may be bent as the previously used sound may in-

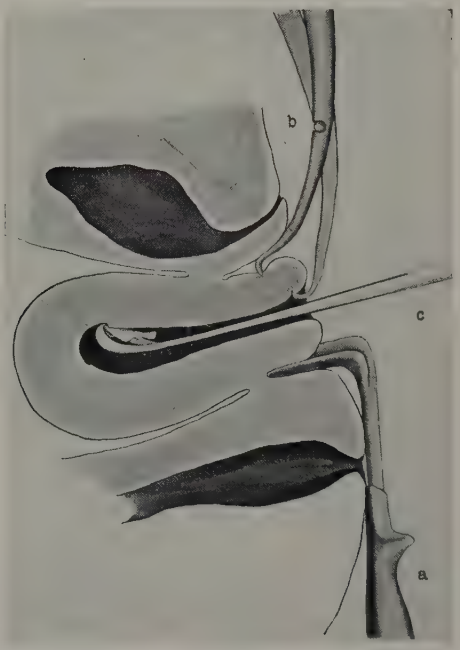


Fig. 5473.—Curetage of the Uterocervical Canal: – a, Posterior vaginal speculum; – b, tenaculum forceps grasping the anterior lip of the cervix and thereby drawing the uterus downward and forward – though unnecessarily and unwisely far, as here shown.

dicate so as best adapt it to the cervico-uterine axis. A methodical plan of going over the walls of the uterine cavity should have been determined upon, so that no part may be skipped. No force should be employed at any stage of the procedure – as the uterus has been frequently punctured – and the knowledge of the cause of death not known until revealed at the *postmortem*. It is well to have one curet bent forward, for the anterior uterine wall – and another bent backward, for the posterior wall. The method of scraping is from the fundus toward the os – usually the posterior wall first, each succeeding downward pull of the instrument overlapping the preceding sufficiently not to leave any ribbon of unremoved mucosa between (Fig. 5473). The anterior wall is gone over in the same way. The mucosa of the fundus is best removed by a combination of these movements together with lateral sweeps of the instrument. Especial care is to be taken in removing the mucosa from

the angles of the uterine horns, at the openings of the fallopian tubes. A great deal of the efficiency of the technic will depend upon the accuracy of contact of the edge of the curet with the walls which are being denuded. A palpable and seemingly audible rasping, grating usually indicates the passage of the cutting edge of the curet through the mucosa down upon the muscularis. It has been noticed in uteri bisected after what had been considered careful curetage that strips of unremoved mucosa are often present.

If the cervical canal is to be included in the curetage of the uterine cavity this is then carried out as already described (v. p. 242).

Fig. 5474.—Bimanual Replacement of the Uterus in the Pelvic Cavity – at the end of curetage or other procedures in which it has been drawn downward and displaced backward. The gauze held in the hand will be packed into the vagina lightly as the hand is withdrawn.

A considerable amount of débris is apt to obstruct the uterine cavity after curetage – which is best removed by carrying in a cotton or, preferably, gauze applicator – which by rotation within the cavity will usually bring away the detached tissue. Irrigation may also be used. Sometimes strips of partially detached tissue or even a polyp may remain – which may be grasped, in the dark, as it were, at the end of the operation by inserting a pair of uterine dressing forceps into the cavity and opening and closing the blades.

Applications, irrigations, and packings, when indicated, are carried out in the manner to be described in the following sections.

Following curetage one should make sure that the uterus is returned to its

normal position in the pelvic cavity – especially if it has been markedly drawn downward (Fig. 5474). The patient is generally put to bed for a week or ten days.

IRRIGATION OF THE UTERINE CAVITY AND CERVICAL CANAL

Douching of the cavity of the uterus and the canal of the cervix follows curetage of these structures as a routine in the practice of some – while omitted

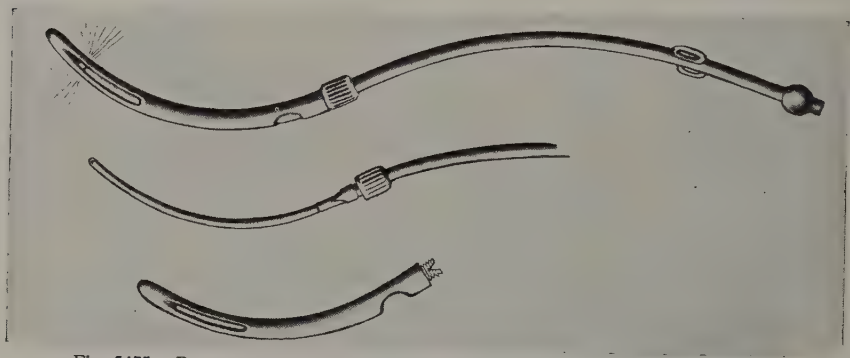


Fig. 5475.—Bozeman-Fritsch's Intra-uterine Irrigator – the parts dissembled

Fig. 5476.—Irrigating the Uterocervical Canal – by means of Leonard's dilating irrigator. (The uterus has been here too far drawn outward.)

in that of others (swabbing out the débris with gauze or cotton applicators taking its place).

On the other hand, irrigation of the uterine cavity is sometimes carried out as an independent procedure – as in infection following childbirth before deciding that curetage is necessary.

Double-flow irrigators (Fig. 5475) – or combined return flow and dilating irrigators are those most frequently employed.

The patient is in the dorsal gynecologic posture and the speculum in position that was used for the immediately preceding curetage – or, where no other procedure has preceded the irrigation, no form of vaginal dilator is required. The vagina should always have been irrigated in advance of irrigating the uterine cavity – to prevent carrying further or added infection into the uterus. Before throwing fluid into the uterine cavity one should be convinced that ample outflow is provided – else fluid may, under sufficient pressure, be forced into the fallopian tubes. This provision is generally covered in the return-flow and dilating forms of irrigators – otherwise the cervical canal might have to be previously dilated (in those technics where it may not already have been done). The tip of the irrigator is carried up to the fundus of the uterus (Fig. 5476) – the flow not being turned on until then, or turned on after the irrigator passes the internal os – and is allowed to flush out the uterine cavity in its back flow. The tip of the irrigator should be turned in different directions. To avoid intra-uterine pressure provision for a greater outflow than inflow should always be made. The irrigating fluid may be plain sterile water, saline solution, or medicated fluid.

If a flushing curet (v. Figs. 5465–5467) be employed the débris which is removed by the curet is at once removed by the accompanying stream of fluid.

The fluids frequently used in intra-uterine douching are the following: – solutions of bichlorid of mercury, carbolic acid, lysol, boric acid, normal saline, and the like.

MAKING APPLICATIONS TO THE WALLS OF THE CERVICAL CANAL AND UTERINE CAVITY

Application of some cauterant or germicidal fluid to the walls of the cavity of the uterus or walls of the cervix, or both, following curetage and the re-

Fig. 5477.—Making Application to the Walls of the Uterine Cavity – and Cervical Canal

moval of the débris of the curetment (either by irrigation or by dry mopping) is a common practice.

This is generally accomplished by twisting a thin, flat layer of cotton upon the end of a pliable form of applicator, which should be molded into the predetermined axis of the tract. This is dipped into the medicating fluid – the dripping portion of the excess of the fluid pressed away – and the applicator is carried to the portion of the uterine or cervical tract to which it is desired to make the application (Fig. 5477) – generally both to uterine and cervical canals. The medicament is brought closely into contact with the surface to which it is to be applied by a process of rubbing the applicator against that surface. Such excess of fluid should not be used as might trickle over parts where it is not wanted.

The fluids which are thus most frequently applied are the following: – tincture of iodin – equal parts of tincture of iodin and carbolic acid – adrenalin solution (to control some forms of hemorrhage). Strong acid cauterants are sometimes applied, especially to the cervical canal.

Following the making of applications to the uterocervical tract provision must be made against damaging the vaginal wall by the escape of any of the fluid in a still strong enough combination to do harm – and this is best accomplished by lightly packing the vaginal cavity with gauze – or, at least, a light plug of gauze against the cervix.

PACKING THE UTERINE CAVITY AND CERVICAL CANAL

Unless there be special indication for doing so, gauze packing of the uterine cavity, as a matter of routine, following curetage, is a matter of individual

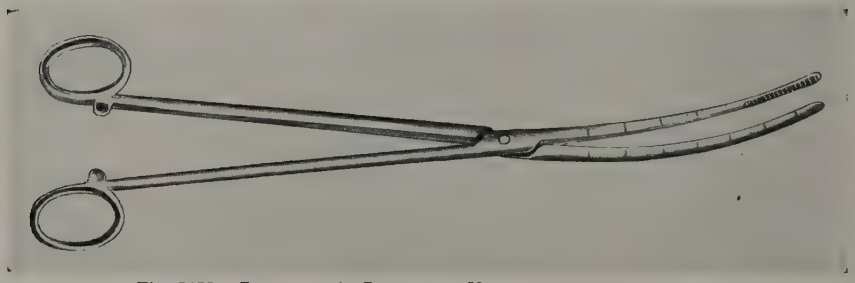


Fig. 5478.—Bainbridge's Graduated Uterine Dressing Forceps.

view and habit. In the presence of special conditions, however, packing may become an indication. In bleeding from the uterine cavity, for instance, a fairly firm gauze packing should be introduced – plain, dry, sterile gauze – or some of the strips moistened in adrenalin solution – as it may also be where one has dilated and cureted the cervical canal for obstructive dysmenorrhea.

It will be supposed, in the present instance, that curetage has been performed – after which the débris has been irrigated or wiped away, and that some form of application has been made – but that the uterine walls bleed, or that the cervical canal has been very much contracted, and more prolonged dilatation of it is desirable – packing is indicated. The posterior vaginal speculum is still in position – and the cervix grasped and steadied by tenaculum forceps.

The packing is done with strips of gauze – and the strips may be carried up to the fundus of the uterus, through the already dilated cervical canal, and thence made to lightly or firmly fill the cavity downward either by means of an ordinary uterine dressing forceps – or by a graduated form of dressing for-

ceps (Fig. 5478), whereby one may know the depth to which the successive portions of the gauze strip are being carried.

A somewhat better method of accomplishing the packing is probably through a gauze packer (Fig. 5479). The cannula of the instrument is carried up to the fundus of the uterus, and, while held there, portions of the gauze strip are pushed down the cannula by means of the pronged gauze carrier – the cannula being gradually withdrawn as the cavity is filled with the gauze packing (Fig. 5480).

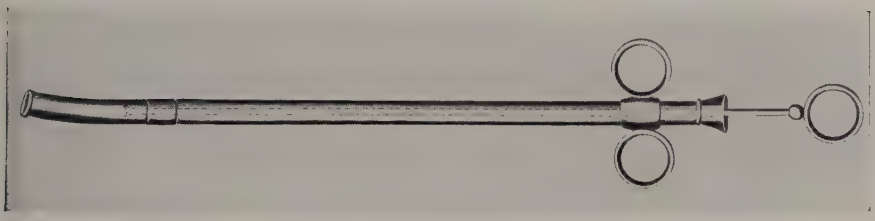


Fig. 5479.—Rapid Gauze Packer.

Where packing of the uterine cavity alone is sought, the single strip of loose gauze is brought through the cervical canal, and left protruding into the vagina sufficiently far to be caught when it is time for withdrawal.

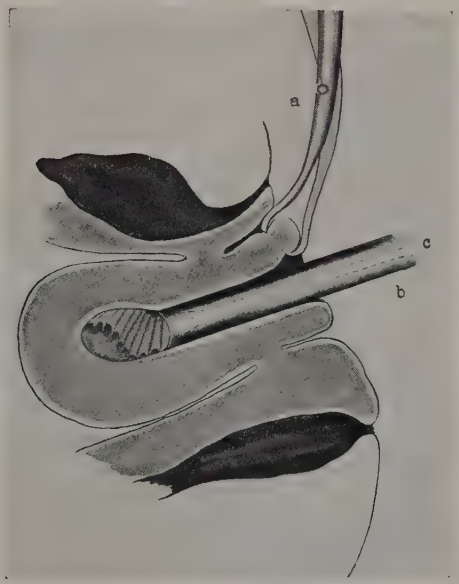


Fig. 5480.—Packing Gauze Into the Uterocervical Canal – by means of a special gauze packer.

Where, on the other hand, pressure against the walls of the cervical canal is sought – either for the purpose of controlling bleeding, exercising dilatation, or maintaining the contact of the medicament of the medicated gauze, then the cervical canal should also be actively packed, as the cannula is being withdrawn, with as much looseness or firmness of the packing as may be indicated.

Packing of the vaginal cavity with wider strips of gauze is sometimes in-

Fig. 5481.—Packing the Uterine, Cervical, and Vaginal Cavities with Gauze Strips.

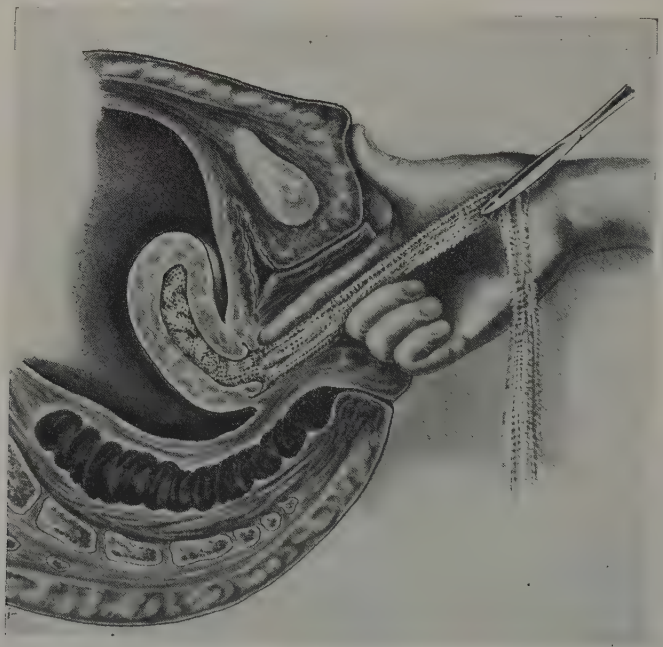


Fig. 5482.—Steadying the Cervix with the Left Index-finger While Withdrawing Gauze Packing—so as to avoid bringing the uterus into prolapse or retroversion in the act. (Redrawn from Crossen.)

dicated to be carried out as a reinforcement of the intra-uterine and intra-cervical packing—especially in cases connected with pathologic phenomena

associated with the early months of pregnancy. Intravaginal packing may also be carried out after the uterus and cervix have been packed independently of pregnancy – as shown in Fig. 5481.

Again, packing of the vagina alone (which, more properly, belongs among vaginal operations) may be indicated – and is carried out in the same manner as when done in conjunction with packing the uterine and cervical canals. It is best accomplished through some form of speculum – preferably of the bivalve type, as illustrated in the picture last quoted. The glass tube containing the strip of gauze is held directly under the base of the speculum – while the plaited ribbon of gauze is fed through the speculum, up again the cervix, and on down through the anteroposterior blades of the speculum and the lateral walls of the vagina, by means of long-handled dressing forceps. Finally, while maintaining by means of a finger or an instrument pressure against the mass of gauze, which has nearly reached the vaginal outlet, the blades of the speculum are withdrawn – but with sufficient care to avoid also bringing the gauze packing with them.

Gauze packing usually remains *in situ* for twenty-four hours – and is then removed entirely – or is replaced by fresh packing.

In the withdrawal of gauze packing from the uterine cavity – especially when the intra-uterine packing has been firmly placed – the uterus, unless countersteadied, may be downwardly and backwardly displaced in the act of withdrawal. To avoid this, this tendency should be counteracted by the placing of the tip of the left index-finger against the anterior lip of the cervix, while forceps in the right hand draw the gauze strip out of the uterus – as shown in Fig. 5482.

SECURING ENDOCERVICAL AND UTERINE SCRAPINGS AND CERVICAL TISSUE FOR EXAMINATION

Scrapings from the uterine cavity and from the cervical canal may be secured by the ordinary method of curetage (v. p. 240) – but are not very satisfactory, as a rule, unless such curetment happens to bring away some tangible portion of tissue, such as part of a tumor growth.

The securing of a more significant specimen from the cervix, however, is a much more certain and easier proceeding – and, besides, is the source from which we are most apt to obtain early evidences of malignancy as a guide to radical operation.

Cervical specimens can generally be taken without the usage of any locally deadening agent, owing to the relative insensitiveness of the part – but if any be needed, a pledget of cotton, saturated in cocain solution, may be pressed against the part for a few minutes – or a small amount of novocain solution may be injected. The portion of tissue to be examined is generally taken from the margin of the cervical canal through a bivalve speculum – and is conveniently obtained either by cervical tenaculum scissors, in the manner shown in Fig. 5483, **b** – or by means of punch forceps, Fig. 5483, **c**.

If no special instrument be available, an ordinary toothed forceps and knife may be used.

If the bleeding following this small operation does not spontaneously cease, a pledget of cotton, saturated with 1 : 1000 adrenalin solution, held in contact with the bleeding surfaces, will usually suffice. If the bleeding continues, the surfaces from which the V-shaped excision has taken place may be brought together by one or two fine catgut stitches.

In all cases where specimens have been taken and the surface from which they are cut are not at once brought together by sutures, these surfaces should

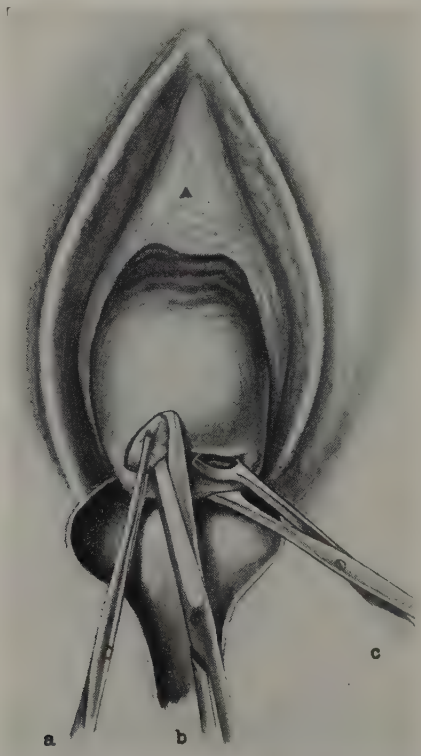


Fig. 5483.—Securing Cervical Tissue for Examination: – a, Forceps grasping the involved margin of the upper cervical lip; – b, special angulated scissors removing a triangular piece of the lip; – c, biting out a piece of the lower cervical lip with punch forceps.

be touched with some cauterant acid or with the actual cautery point – so as to completely seal off the lymph-spaces.

THE DIGITAL EXAMINATION OF THE DILATED CERVICO-UTERINE CANAL

The circumstances under which the introduction of the finger into the intra-uterine cavity is indicated are chiefly those connected with the removal of growths within the uterus and with the removal of the retained products of conception. In this latter category of cases the subject more properly comes up under the Operations upon Pregnant or Puerperal Uterus (see Index).

The introduction of the finger into the uterine cavity presupposes the dilation of the cervical canal up to a diameter sufficient to admit the second joint of the first or second finger. In obstetric cases this may have been accomplished by nature. In other cases it is usually accomplished by instrumental stretching (v. p. 233). To enable the finger to reach the cavity of the uterus, however not only is dilatation of the cervical canal necessary, but the uterus itself must be brought lower down into the pelvis, as the reach of any of the fingers is distinctly limited. To accomplish this the following maneuver is adopted;.. The vagina is dilated by a posterior weighted speculum – after which the cervix of the uterus is seized by laterally placed, bipronged tenaculum forceps, whose points grasp the outer anterior aspect of the cervix.

but invade no part of the cervical canal – and, thus grasped, the uterus is brought down and steadied until the Surgeon's finger gains entrance into the cervical canal. Then his opposite hand grasps or is placed over the fundus of the uterus through the abdominal wall – and forces the body of the uterus downward toward and upon the finger which is entering it from below through the dilated cervical passage (Fig. 5484). By a combination of these two maneuvers the finger may often be made to sweep over the various aspects of the uterine wall – both for examination – and for the separation of

Fig. 5484.—The Digital Examination of the Dilated Cervico-uterine Canal – brought into reach from the vaginal outlet, while the fundus of the uterus is being depressed by the opposite hand placed behind the pubic symphysis.

adherent structures, or for the detachment of growths. At intervals between digital manipulation the finger may be withdrawn, and forceps and other instruments be introduced into the cavity – for special technical procedures for which they may be better adapted – after which the finger may be again introduced for corroboration.

Finally, the uterine cavity is douched, or application made, or packings placed – as may be indicated.

DIGITAL EXAMINATION OF THE UTERINE CAVITY THROUGH THE INCISED CERVICO-UTERINE CANAL

In addition to the information concerning the uterine cavity available by the use of a uterine sound – and in those cases in which it is not possible to introduce the finger into the cavity through the dilated cervical canal (v. p. 233), as it is generally not – it is sometimes indicated to incise the cervico-uterine canal, extraperitoneally, and then to examine the walls of the uterus by introducing a gloved finger through the temporary opening.

Kelly's technic in accomplishing this is as follows:—The anterior lip of the cervix is seized by two tenaculum forceps, lateralad to the median line, and drawn down to the vaginal outlet—the posterior vaginal wall being retracted by a weighted speculum. A slightly curved, transverse incision is made in the anterior fornix about 2.5 cm. (1 inch) above the os—the cut coming down upon the cervix in its drawn-down position. Working through this incision, by blunt dissection, carried out by means of gauze over the end of the finger, in the connective-tissue plane between the anterior wall of the vagina and the body of the cervix, the bladder is freed upward as far as the peritoneal reflection—and held out of the way by a retractor. The anterior

Fig. 5485.—Digital Examination of the Uterine Cavity Through the Incised Cervico-uterine Canal;—Through a transverse vaginal incision the bladder has been freed upward from the anterior wall of the cervix—which has been divided in the median line by scissors. The anterior cervical wall has been thus split, and the two halves are being drawn apart—preparatorily to the introduction of the finger into cavity of the uterus.

wall of the cervix is then divided in the median line by means of stout scissors (Fig. 5485), the section passing, if necessary, into the body of the uterus. The two halves of the split anterior cervical lip are then drawn apart by the still retained tenaculum forceps—and through the opening thus made the gloved finger is carried into the cavity of the uterus—either for the purpose of exploration or to aid in some operative procedure.

When the object has been accomplished for which the division of the cervical wall was made the two cut cervical borders are brought together and carefully sutured back into position by chromic catgut stitches. The outer ends of the incision made through the cervicovaginal mucosa are sutured—

but a temporary gauze drain should be inserted into the center of the incision, to be withdrawn in two or three days.

OPERATIVE TREATMENT OF EROSION OF THE CERVIX UTERI

Definition.—In this condition there is a glandular or adenomatous overgrowth of the mucosa of the cervical canal and of the face of the cervix, extending sometimes, though exceptionally, even to the vaginal mucosa. The application of astringents and of cauterants is usually made before resorting to operation. If this fail, and if a condition be also present such as laceration, which may call for trachelorrhaphy, the latter operation will probably cure both states. Under other circumstances one of the following procedures may be adopted:

Curetage of the Eroded Mucosa.—The cervix is brought into the field and steadied by tenaculum forceps, and the diseased mucosa, with its deep-lying glands, is cureted away with a sharp spoon curet (Fig. 5486). It is well to apply pure carbolic acid to the cureted surface in addition. As the cervical canal is usually also involved (indeed primarily, as a rule), curetage of this canal should also form a part of the procedure.

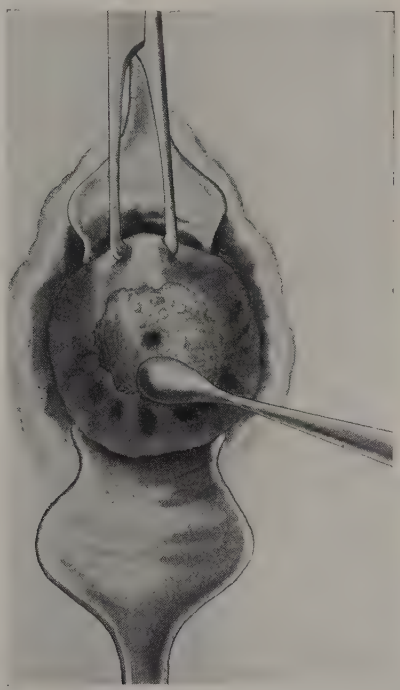


Fig. 5486.—Curetage of the Eroded Cervical Mucosa.

Excision of the Eroded Mucosa.—In cases where the involvement is not so great but that sound mucosa may be brought together afterward, the diseased portion of the mucosa, both that lining the outer aspect of the cervical canal and that upon the face of the cervix, is excised. The excision is planned in such a way, by the general elliptic contour given the outer incision, and the circular section of the endocervical mucosa (Fig.

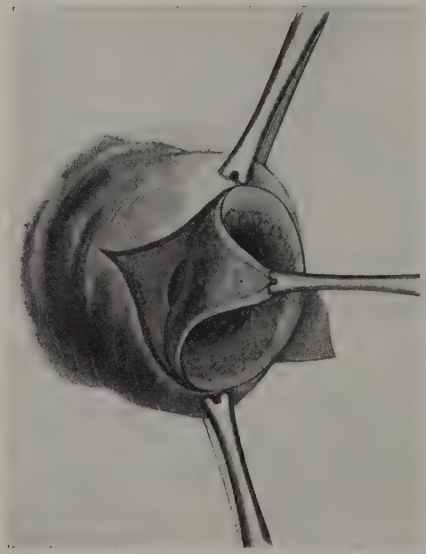


Fig. 5487.—Excision of the Eroded Cervical Mucosa — I; — The mucosa of the eroded area, outlined without by an elliptic incision, and within by a circular one, is being dissected from its bed.

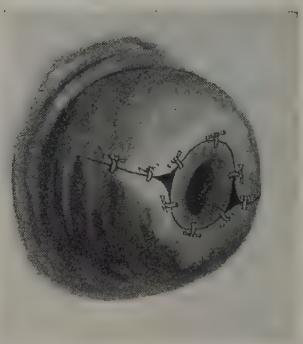


Fig. 5488.—The Same — II; — The sound mucosa on either side of the lines of section has been sufficiently mobilized to allow the resulting healthy mucosal flaps to be brought together by suture.

5487) that, following mobilization of both the contiguous outer and inner mucosa, the resulting flaps can be brought together by suture (Fig. 5488).

In extensive involvement amputation of the cervix is required.

OPERATION FOR TRAUMATIC OR PATHOLOGIC OCCLUSION OF THE CERVICAL CANAL

The most frequent causes of acquired occlusion of the cervical canal are: — traumatisms during childbirth — too tight operative closure of the canal — and adhesion resulting from some granulating or diseased conditions of the cervix.

If the condition occurs prior to menstruation it is not usually known until the establishment of that function. The source of discovery of the condition is generally the accumulation, within the uterus, of the blood and mucous discharge of one or more menstrual periods — constituting hematometra (Fig. 5489).

The operative relief of the condition is in average cases readily accomplished. This is the case when two conditions are present — some dimpling, or scar, or other mark to show the position of the external os — and a normal position of the uterus and cervix. When there is no sign whatever to indicate the site of the former os, considerable difficulty may be experienced — and it may be absolutely impossible to secure any guide whatever. There may be within the vagina nothing detectable to either palpation, or vision through a speculum, or through the separated vaginal lips, but a perfectly symmetric, tense ball. Bimanual examination — by a finger in the vagina and the fingers of the opposite hand pressing down over the pelvic wall — and also a finger in the rectum and the depressed pelvic wall — will often furnish some aid in establishing the general direction of the uterocervical canal — without which one cannot safely direct a cutting instrument. In the absence of such data

not even an exploratory needle will do more than secure fluid after puncturing the tumor _ without definitely settling either the position of the external os or the axis of the uterocervical canal. It fortunately happens that intrauterine distention will usually straighten an otherwise deflected uterocervical passage. If the opening be wrongly made, this discovery is detectable in a few days after the parts subside.

If the desired data can be secured one directs a straight, narrow bistoury through the obstructing barrier, guided by such data. If no data whatever can be secured, as one knows from experience, then, literally, must the stab be

Fig. 5489.—Hematometra.

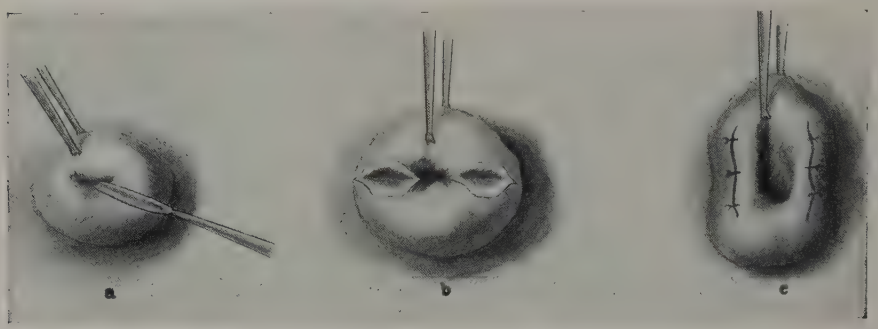
in the dark _ directed as well as may be, according to the judgment of the individual Operator in the particular case. As soon as the barrier has been incised, fluid will flow _ and this should be made to take place gradually. The original cut may have to be slightly increased _ either by knife cut or scissors cut _ or, possibly better, by a uterine dilator. Scrupulous care must be taken to avoid infection _ which has been the cause of many deaths. Reclosure of the passage may, exceptionally, have to be guarded against by the occasional passage of a dilator.

TRACHELOTOMY _ TRACHELOPLASTY _ AND EXCISION OF THE OS EXTERNUM AND ADJACENT ENDOCERVICAL MUCOSA _ FOR CONSTRICTION OF THE CERVICAL OPENING

The object of these operations is to permanently enlarge a cervical orifice which may be constricted either as the result of congenital deformity or which may be the acquired result of some defect. Several technical procedures are available _ some of which follow:

Operation for Constricted Cervical Opening by Trachelotomy by Bicommissural or Transverse Bilateral Incisions, Followed by Suturing the Wound Lips in the Opposite Plane.—The cervix is steadied in the grip of forceps and two transverse incisions are made at the junction of the anterior and posterior cervical lips _ extending across the face of the cervix and into the beginning of the cervical canal, the extent and depth of the incisions being determined by the degree of the constriction (Figs. 5490 and 5491). The lips of these wounds are then approximated in a vertical axis by transversely running sutures (Fig. 5492).

Operation for Constricted Cervical Opening by Quadrilateral Excision of the Marginal Mucosa, Followed by Tracheloplastic Repair of the Wound.—This procedure has been sometimes applied in cases of pinhole os. A superficial right-angled incision is made transversely across the middle of the cervical commissure _ and a vertical one at a right angle to



Figs. 5490–5492.—Operation for Constricted Cervical Opening by Transverse Bilateral Incisions, Followed by Suturing the Wound Lips in the Opposite Plane: _ **a,** Incising the cervix bilaterally and transversely; _ **b,** the incised cervix; _ **c,** the sutured cervix.

the first _ and the ends of these are connected by four straight incisions _ thus outlining a quadrangular area (Fig. 5493). The mucosa of the four minor areas thus outlined are excised _ after which the margins of the adjacent sound mucosa, both just within the cervical opening and upon the face of the cervix, are limitedly mobilized by undercutting _ and the margins of the

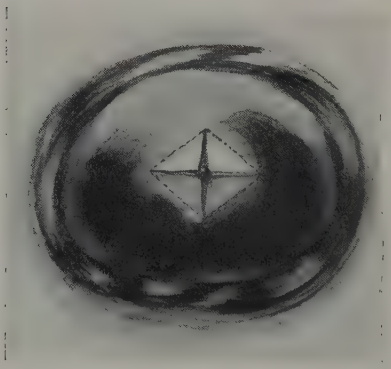


Fig. 5493.—Operation for Constricted Cervical Opening by Quadrilateral Excision of the Marginal Mucosa, Followed by the Tracheloplastic Repair of the Wound _ I; _ Two right-angle incisions of sufficient length are made over the os externum, and their ends connected, forming a square _ thus outlining four mucosal triangles to be superficially excised.

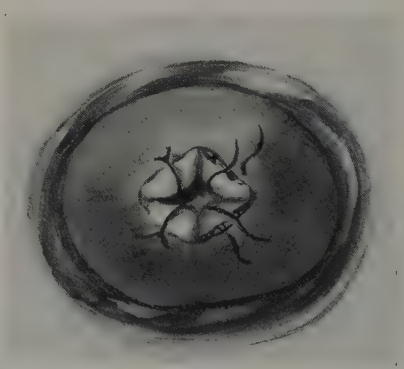


Fig. 5494.—The Same _ II; _ The margins of the cut mucosa within the cervical canal are now united to the margins of the cut mucosa outside of the canal _ thereby forming a new canal bounded by mucosa.

outer cervical mucosa are then sutured to the margins of the inner cervical mucosa (Fig. 5494).

Operation for Constricted Cervical Opening by Lateral Mobilized Mucosal Flaps _ Courty.—Two symmetric lateral triangular flaps, with apices at the external os and bases toward the lateral vaginal fornices consisting of mucosa, are outlined (Fig. 5495, **abc** and **def**). These two triangular flaps

are raised and turned outward, hinging at their bases (Fig. 5496, **ce** and **fh**) at the junction of the cervical walls and the lateral vaginal fornices. The con-

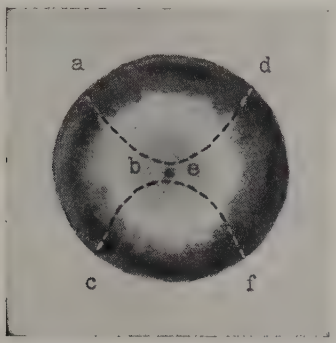


Fig. 5495.—Operation for Constricted Cervical Opening by Lateral Mobilized Mucosal Flaps – Courty – I: – abc and def, Two symmetric triangular flaps of mucous membrane and connective tissue to be raised from the lateral aspects of the cervix.

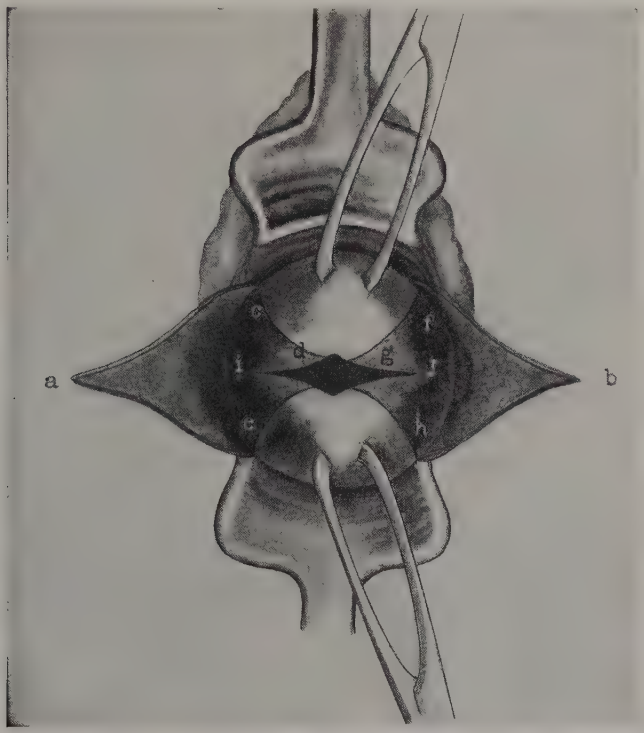


Fig. 5496.—The Same – II; – Vaginal retractors are in position and volsella are grasping the undenuded portions of the cervix: a, Right cervical flap raised from the area, cde; – b, left cervical flap, from the area fgh; – ij, straight transverse incision through the deep cervical tissues enlarging the os and cervical canal (the elongated diamond contour resulting from the pull of the volsella).

vex portion of the face of the cervix is then incised transversely, the incision running through the middle of the external os as deeply as the circumstances of the case may seem to indicate (v. Fig. 5496, **dg**). The two mobilized lateral

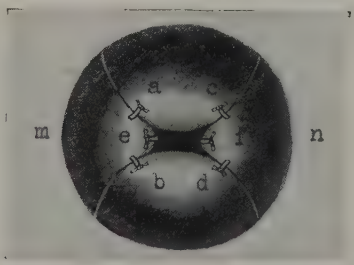


Fig. 5497.—The Same—III;—Flaps **m** and **n** are brought back into position and sutured to the denuded cervical mucosa at **a** and **b** and **c** and **d**. The free tips of the flaps are then sutured into the two lateral walls of the incised cervix at **e** and **f**.

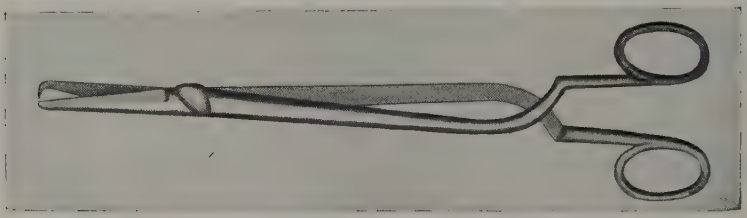


Fig. 5498.—Prong-gripping Scissors—for incising tissues from which the hold is apt to slip.

Fig. 5499.—Operation for Constricted Cervical Opening by Median Section and Limited Triangular Excision of the Cervical Margins, Followed by Trachelorrhaphy—McKay's Technic—I;—The line of median scissors section.

Fig. 5500.—The Same—II;—The posterior median section has been made—and then a triangular slip has been cut from both free margins—after which a V-shaped excision of some of the muscular tissue has been made, trough-like, from the raw surface of each flap margin.

flaps are then turned back inward, and their apices are sutured to the endocervical mucosa with fine chromic catgut (Fig. 5497, **e** and **f**) _ and their margins to the margins of the adjacent unraised mucosa (v. Fig. 5497, **a**, **c**, **b**, **d**).

Operation for Constricted Cervical Opening by Posterior Median Section and Limited Triangular Excision of the Cervical Margins, Followed by Trachelorrhaphy _ McKay's Technic.—A posterior vaginal retractor is placed in position and the cervix drawn down by tenaculum forceps. The round-pointed end of a pad of special scissors (Fig. 5498) is carried into

Fig. 5501.—The Same _ III; _ The sutured cervical opening.

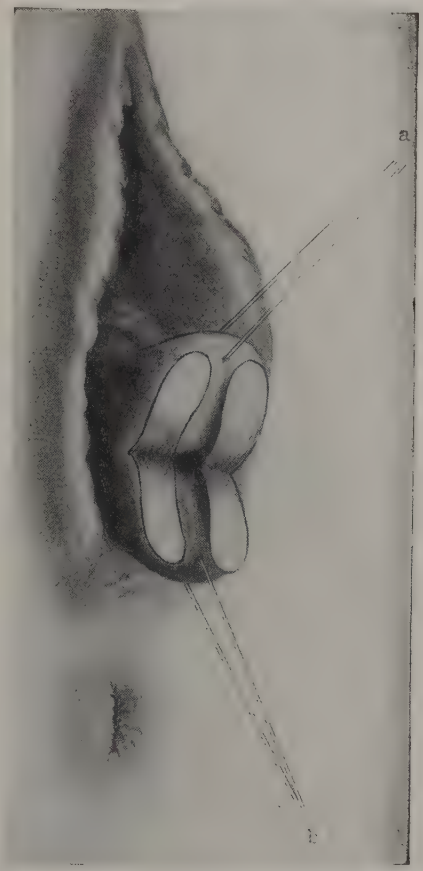


Fig. 5502.—Operation for Constricted Cervical Opening by Bilateral Division and Partial Excision of the Cervix _ Pozzi's stomatoplasty _ I; _ The bilateral splitting of the cervix _ (here somewhat exaggeratedly shown).

the cervical canal for about 2 cm. ($\frac{3}{4}$ inch) _ the crochet-tipped blade being upon the outer side _ after which the blades are brought together, dividing the posterior lip of the cervix medially (Fig. 5499). The free margin of the cervical end of each lip is then seized with forceps and a narrow triangular piece is excised from each lip with its base above _ so that the resulting appearance is as shown in Fig. 5500. Further, a wedge-shaped piece of tissue is excised from the raw aspect of each lip, leaving a trough-like depression running its length. The outer and inner margins of each lip, on each side, are

sewed together in such a way as to leave an open posterior V in the cervix (Fig. 5501). The object of adding the excision of a strip of tissue from the margins of each lip is to insure a sufficiently patulous opening subsequently _ and the object of the trough-like excision of the intermediate muscular tissue is to enable the inner and outer lips to be approximated by suture. A deep suture at the apex of the wound is useful in preventing hemorrhage, which sometimes occurs and may be obstinate.

Operation for Constricted Cervical Opening by Bilateral Division and Partial Excision of the Cervix _ Pozzi's Stomatoplasty.—Tenaculum forceps (which are preferable to the silk tractors shown in Fig. 5502 and which are apt to be cut) are placed in the anterior and posterior lips of the cervix.

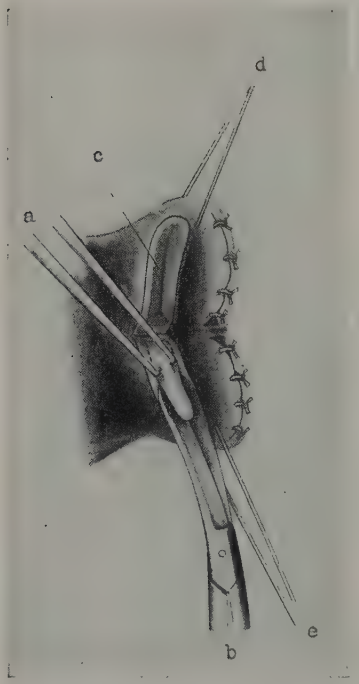


Fig. 5503.—The Same _ II: _ **a, b,** Excising wedge-shaped pieces of tissue from the four raw beds of the two split cervical lips. The two wounds of the opposite side are shown sutured. (The parts here show some exaggeration of the technic.)

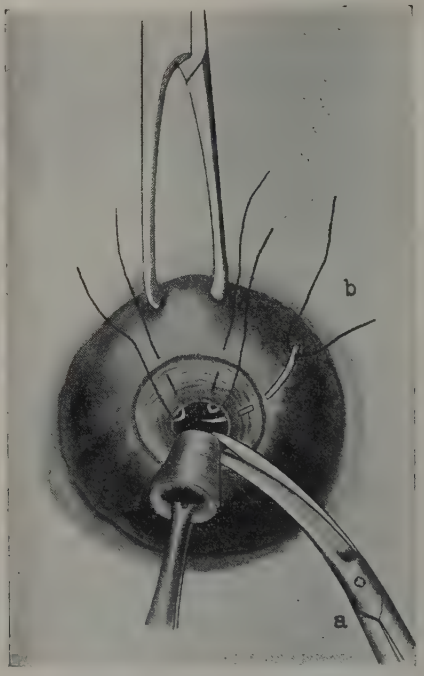


Fig. 5504.—Operation for Constricted Cervical Opening by Excision of the Os Externum and Adjacent Endocervical Mucosa _ followed by the suturing together of the cut margins of the mucosa outside and inside of the cervical canal.

While the cervix is thus drawn forward and steadied stout scissors divide the cervix upon both sides _ dilatation of the cervical canal being first resorted to if required to enable one blade of the scissors to enter the canal. The backward extent of the scissor section will be determined by the amount of enlargement planned _ (which is shown upon a too extensive scale in the pictures of this series). In cases where the cervix is hypertrophied a triangular prism of tissue is excised from the center of each of the four raw aspects of the divided lips _ in the manner shown in Fig. 5503, **a, b.** In excising these four small wedges the undenuded tract for the cervical canal must not be encroached upon, nor must the tissue at the hinge bases be excised. In the original technic the margins of each of the four wounds were separately brought

together by silver wire _ but chromic catgut would probably be better (v. Fig. 5503). At first the sutured lips look like duck's bills _ but this contour is lost in subsequent retraction.

Operation for Constricted Cervical Opening by Excision of the Os Externum and Adjacent Endocervical Mucosa _ Pouey.—The cervical canal is first stretched by means of Hegar's dilators (v. p. 238). A circular incision is then made just outside of what would constitute the outline of the normal external os. The tissue lying within this, including the margin of the cervical canal, is then seized with clamp forceps _ and, while thus held, a cone-shaped piece of mucomuscular cervical tissue is excised _ its base corresponding with the face of the cervix _ its walls lying just outside of the narrowed cervical canal and exit. When this cone has been freed sufficiently far inward it is transversely divided (Fig. 5504, a), after which the margins of the endocervical mucosa is sutured to the margins of the cervical mucosa.

OPERATIONS FOR LACERATION OF THE CERVIX UTERI _ TRACHELORRHAPHY

Description.—Trachelorrhaphy is applied to the repair of laceration of the cervix uteri. In immediate operations, where the repair is made at once following its reception (v. Operations Upon the Puerperal Uterus, Index), the surfaces of the fresh wound are simply brought together by suture. In intermediate operations this is done after cureting the granulating surfaces. In secondary operations the technic is twofold _ the surfaces to be approximated are first made raw by one of several methods of denudation _ and these surfaces are then brought together by some form of suturing. It is the secondary type of operation which will be here considered.

It is to be distinctly understood that trachelorrhaphy is not indicated in wholesale and indiscriminate fashion in every kind and grade of laceration of the cervix. In some minor forms of tear, in the absence of other phenomena, the denudation and suturing of a soft, limited cervical irregularity might only serve to impede uterine drainage. Trachelorrhaphy, on the other hand, is distinctly indicated in the presence of such more or less associated phenomena as multiple medium tears _ one or more deep tears _ extroverted cervical mucosa _ congested cervical glands, obstructed by tenacious mucus _ infiltrated, hypertrophied cervical lips, with cystically degenerated and eroded mucosa _ constituting the picture complex of a chronic cervicitis, with the exhibition of hemorrhage and leukorrhea, and accompanied by general symptoms. An additional reason for operating upon cervices upon which operation is distinctly indicated is that such conditions have frequently been found associated with malignancy.

Methods of Operating for Lacerations of the Cervix and Their Results.—Two general methods of procedure are practised: _ Trachelorrhaphy, or the suturing together of the freshened surfaces of a torn cervix, is employed for the direct repair of the tear itself _ and Partial Amputation of the Cervix, to remove some of the consequences of cervical lacerations (such as hypertrophy, glandular degeneration, and the like). Some of the trachelorrhapies are, in fact, partial amputations _ though not so distinctly so as some of the more typical forms of partial amputation.

Some of the chief forms of trachelorrhaphy will be here described.

Preparation for Trachelorrhaphy.—Preliminary treatment is advisable in congested cervices. The cervix is depleted by multiple puncture with a bistoury every two or three days, thus lessening the size of the parts by bleeding and by evacuation of the cervical glands, followed by boroglycerid applications and by hot antiseptic douching several times daily. Accom-

panying conditions, such as endocervicitis, endometritis, prolapse, retroversion, and the like, should be treated during the preparatory period. Tonic medication and daily bowel movements form a part of the preparation.

In immediate preparation for operation the vagina is antiseptically douched — the uterus is cureted as a routine by some Operators, followed by intrauterine douching — and the cervical canal and the outer aspect of the cervix painted with the tincture of iodin.

If indicated, the cervical canal is dilated and cureted before trachelorrhaphy.

Repair of the Lacerated Cervix Uteri by Emmet's Method of Trachelorrhaphy.—The patient may either be placed in Sims' position and a Sims'

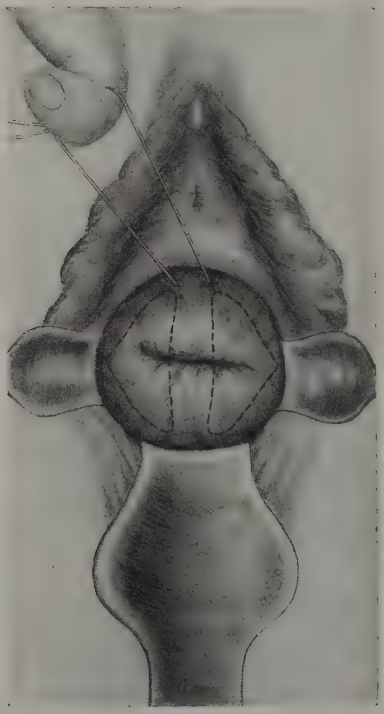


Fig. 5505.—Repair of the Lacerated Cervix Uteri by Emmet's Method of Trachelorrhaphy — I; — Outlining the areas for denudation. The cervix is here held forward by a silk tractor. The median area, to be left undenuded for a new cervical canal, is noted.

speculum employed for posterior retraction — or, as is generally the rule, the patient is put in the dorsal gynecologic position, with a weighted posterior or hand-held speculum, with or without the aid of lateral retraction. The uterus is held conveniently in the field in one of the several methods shown in the accompanying illustrations — usually by being grasped by tenaculum forceps so placed as to be out of the way of the field of operation.

Denudation of the lacerated lips of the cervical wound is the first step of the procedure — and the form of this denudation will vary according to the nature, position, and extent of the original laceration. In equal bilateral laceration the denudation is usually symmetric upon the two sides — and is always approximately symmetric between the opposite faces which are to be brought together, whether the laceration be unilateral or bilateral, sym-

metric or asymmetric. The areas to be denuded and approximated are generally first outlined with the point of a knife (Fig. 5505) to avoid the miscalculation which is apt to follow free-hand outlining during denudation. This outline must include all scar tissue, both in extent and in depth _ so that soft, normal parts be left for contact _ with especial care to leave, undenuded, sufficient tissue for the new cervical canal. Several methods of accomplishing the denudation are in use. Probably the best is to first transversely incise through the scar tissue at the angle of the laceration. This will fix the depth of the denudation _ and also the base of each half of the denudation of that individual side (if the laceration be bilateral). With the depth and the outline of the denudation thus fixed, the next step is to free the opposite surfaces of

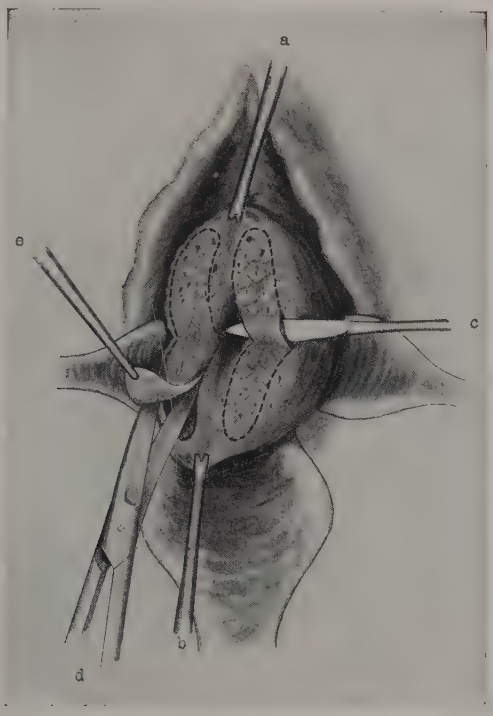


Fig. 5506.—The Same _ II: _ e, d, Denuding an entire side in one piece by means of forceps and scissors; _ c, denuding the opposite side by narrow bistoury, which is thrust through the area transversely and is then made to cut its way outward, both upon the upper and lower lips of the wound of each side; _ a, b, tenaculum forceps grasping the cervix in the position of the outlet of the new cervical canal.

the tissue, chiefly cicatricial, which covers the aspects of the wound to be approximated. The surface of the area to be denuded may be conveniently removed by seizing the apex of the outlined part with forceps and then dissecting this off with scissors in the direction of its hinged base, which has been transversely divided. A knife may be substituted for scissors in making the denudation from the apex toward the base. An angulated knife may be of service. Sometimes _ especially when the cervix is brought well forward _ the denudation may be accomplished in the manner shown in Fig. 5506 _ by inserting a narrow-bladed knife sidewise, at the hinge, and cutting thence outward toward the apices of each outlined area, which is steadied by forceps. It is always easier to denude the inferior half of the area _ which,

also, is the one to be first denuded, otherwise the bleeding from the upper would obstruct the lower half.

Care must be exercised, during the denudation, that the median tract, about $\frac{1}{2}$ cm. (3/16 inch) in width, is nowhere encroached upon _ as otherwise the uterine canal itself might unite, after suturing, and become obliterated. (In one of the Writer's cases obliteration of the canal, followed by hematometra, occurred, requiring incision through the cervical barrier _ whether from too extensive denudation or from adhesion of granulating surfaces along the tract left for the canal could not be determined.)

Suturing of the denuded areas is next in order. Silver wire was formerly used _ the individual sutures being twisted and, later, cut. Chromic catgut (probably preferable) or silkworm filament is now used. A special cervical

Fig. 5507.—The Same _ III: _ **ee, cc, dd,** Suturing the wound by transverse stitches which penetrate the mucosa upon both the vaginal and cervical aspects of the cervix; _ **ff,** the transversely placed stitches here penetrate the vaginal mucosa, but emerge just outside of the cervical mucosa in the raw tissue.

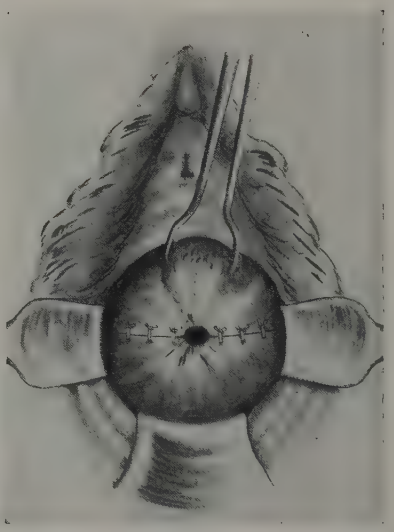


Fig. 5508.—The Same _ IV; _ The finally sutured wound _ irrespectively of which of the three methods of suturing, described in the text, may be employed.

needle is employed _ short, stout, one-half or three-quarters curved _ held in a holder. Silkworm sutures are best introduced upon silk carriers, and their ends cut long and clamped with split shot. The superficial margins of the wound between the deeper stitches may be further approximated with fine chromic catgut. Three methods of placing the sutures will be described _ the first being the one most frequently used: (*a*) The suturing begins above, at the angle of denudation. The needle enters the mucosa of one lip, upon the vaginal aspect of the cervix (Fig. 5507, **e, e**) _ passes transversely inward, under the raw surface, to emerge just *within* the outer margin of the strip of sound mucosa left to form the cervical canal _ crosses over to the cervical aspect of the mucosa of the opposite lip on the same side _ passes, thence, under the raw surface of that side _ to emerge at a point corresponding with the point of entry.

These stitches are continued, parallel with each other, down to the lowermost limit of the denudation of that side. All of the stitches of the first side are clamped together _ while those of the second side are correspondingly placed. The placing of the cervical sutures is much more readily carried out by a person who is ambidextrous _ otherwise the shifts in making the passes from the vaginal aspect of the patient's right side, and from the cervical canal aspect of the patient's left side, are a bit awkward. The sutures of the second side are temporarily clamped _ while the wound and vaginal vault are cleansed of clotted blood by dry gauze mopping or by irrigation (preferably the former).

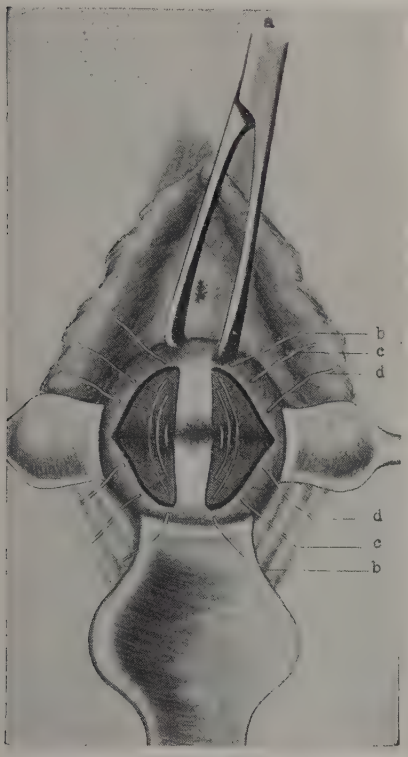


Fig. 5509.—The Same _ V; _ The sutures are here placed more vertically as an alternate method of suturing the lips together _ especially in a wound in which the transverse extent is more nearly equal to or greater than the depth.

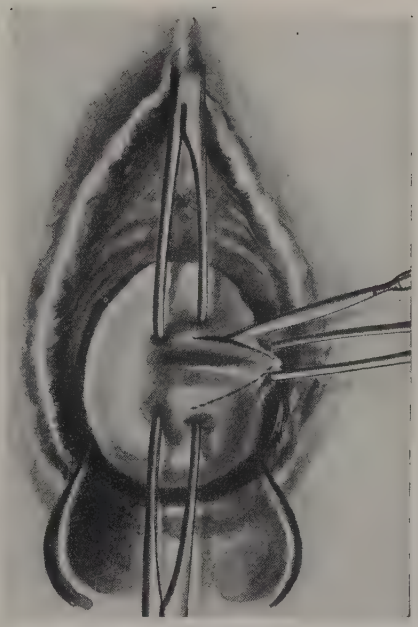


Fig. 5510.—Repair of the Lacerated Cervix Uteri by Saenger's Method of Trachelorrhaphy _ I; _ With the tenaculum forceps placed as described in the text the outline of the flap to be raised is shown _ and the knife in the act of making the incision.

The sutures are then to be tied, always beginning at the base of the wound, where the two lips hinge. Some Operators tie all the sutures of one side first _ then all of those of the opposite side. Other Surgeons tie the sutures of the two sides *pari passu* _ the upper, basal suture of each side _ then the second suture of each side _ and so on, downward (the latter plan being preferable as enabling more accurate adjustment). When the sutures are all tied the parts present the appearance shown in Fig. 5508 _ (and the same appearance of the sutured and tied wound is presented no matter in which of the three ways described the sutures may be placed).

(*b*) Instead of passing the transversely running sutures through the mu-

cosa of the strip of undenuded tissue left for the new cervical canal, they may be made to make their exit just outside of this strip in the raw tissue (v. Fig. 5507, **f, f**). In doing this two things are accomplished _ the stitches are less apt to so narrow the new cervical canal as to interfere with its drainage _ and the cervical wounds on each side of the cervical canal are less apt to be infected by capillary drainage of the uterine discharge into the suture field, possibly interfering with union.

(*c*) Instead of passing the sutures transversely they are sometimes passed vertically, as shown in Fig. 5509. In this case they enter at the apex and emerge at the base of each of the lateral wounds, to re-enter the opposite aspect of the wound of the same side in the same manner.

Finally, the vagina is lightly packed with gauze to absorb wound fluids and uterovaginal discharges _ and a vulval pad applied. If non-absorbable sutures have been used, these are removed in from ten to fourteen days _

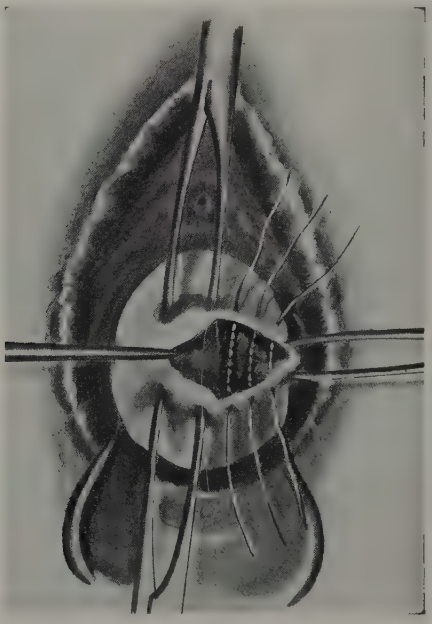


Fig. 5511.—The Same _ II; _ Retracting the dissected flap inward and placing the sutures.

unless a perineorrhaphy have been simultaneously done, in which latter case the vaginal walls should not be retracted to gain access to the stitches for four or five weeks.

Repair of the Lacerated Cervix Uteri by Saenger's Method of Trachelorrhaphy.—The special object of this procedure is to block off, as far as possible, the communication of the cervical wound from the flow from the uterocervical tract. An upper and lower tenaculum forceps grasps the anterior and posterior cervical lips medially _ in a line which is the continuation of the cervical canal, and, for this reason, not in the way of the subsequent incisions. A tenaculum forceps also seizes the lateral aspect of the uterus above the uppermost limit to which the apex of the incision is to extend on each side. These forceps are placed under slight tension in the direction of their holds _ thereby spreading out the tissues in the form of a laterally placed V, with its apex toward the laterally placed forceps, and the ends of its two

lower limbs toward the other two forceps. A sharp-pointed knife now carries a correspondingly outlined laterally placed V-shaped incision from the anterior forceps to the lateral forceps, and thence to the posterior forceps _ in the manner shown in Fig. 5510. This incision deep enough simply to enable a flap, with inward base, to be raised _ after which this flap is freed by dissection, keeping the knife parallel with, first, the surface of the cicitricial face of the anterior lip _ and then parallel with the cicatricial face of the posterior lip _ carefully avoiding during the splitting of the flap the cutting through the base of the flap which hinges inward, and which would defeat the special feature of this technic. The flap is thus split off, layer fashion, from its underlying parts. As this is being done a pair of ribbed forceps grasps its apex and draws the flap outward and inward as the freeing of it progresses. The knife-cuts which free this flap will pass through a slightly inclined plane on each

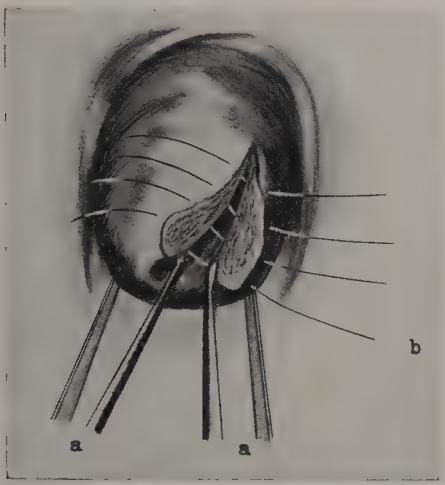


Fig. 5512.—Repair of a Unilateral Laceration of the Cervix.

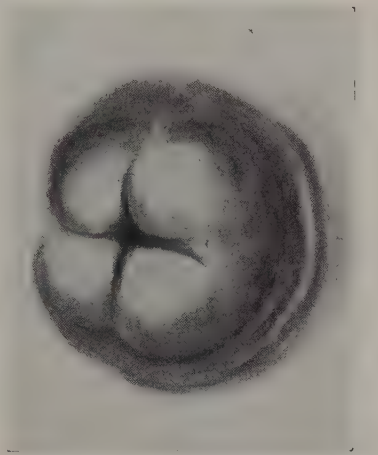


Fig. 5513.—Repair of a Multiple Laceration of the Cervix by Individual Suture of Each Freshened Laceration _ I; _ A quadrilateral or stellate form of superficial laceration in a hypertrophied cervix. The lines along which the scar tissue of the individual lesions will be excised is shown. Where scars are in closer relation to each other two may often be cut into one _ to simplify the repair.

lip, dependent upon the depth of the tear, and meet above and behind the highest part of the tear. While the parts are still held under moderate tension _ and the flap is drawn well inward _ chromic catgut stitches are placed through the opposite margins and sides of the denudations upon the anterior and posterior lips _ as shown in Fig. 5511. These are tied in turn, from above downward, and when the one nearest the base of the flap is to be tied, the flap is first drawn especially well inward. The displaced flap temporarily remains standing outward from the wound _ shielding it somewhat from uterocervical discharges _ but eventually shrinks to a mere nodule. If excessive when the operation is completed, some of its redundancy may be cut away. The same maneuver is repeated upon both sides of the cervical canal if a bilateral laceration be present.

Repair of Irregular Types of Cervical Laceration.—It will sometimes

happen that atypical types of laceration will call for modifications in the method of repair. This modification may be in the direction of either extreme _ in the way of simplication, in the case of minor grades of involvement _ and in the way of increasing the grade of operative procedure, even to the extent of partial or complete amputation of the cervix, in the more marked grades of lesion (including laceration and hypertrophic lesions). Amputations of the cervix will be considered under a separate heading (v. p. 296).

A unilateral laceration is usually treated by the freshening of the margins of the lesion, followed by the suturing of the freshened margins into apposition _ as suggested in Fig. 5512.

Multiple lacerations of the cervix of stellate character may be deep or superficial _ but are more apt to be shallow than is a single laceration, in that yielding of the rim of the cervix in a number of places during delivery of the

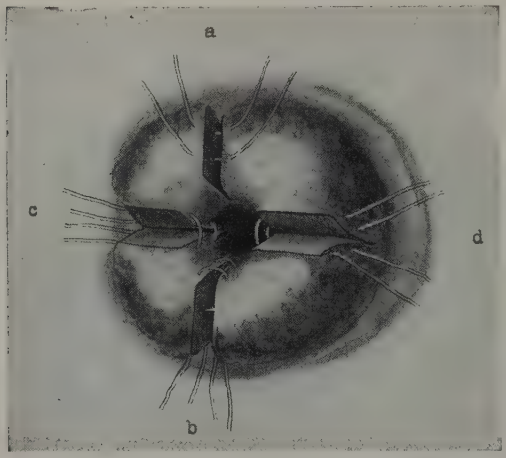


Fig. 5514.—The Same _ II; _ The scar tissue of the four lacerations has been excised _ and the sutures are being placed. These may be placed parallel with the axis of the cervix, as is usually done in superficial wounds, in the manner shown at a _ or transversely to the cervical axis, as is usually the case in deeper wounds, in the manner shown at b, c, and d.

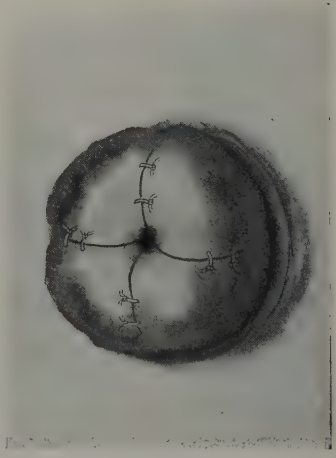


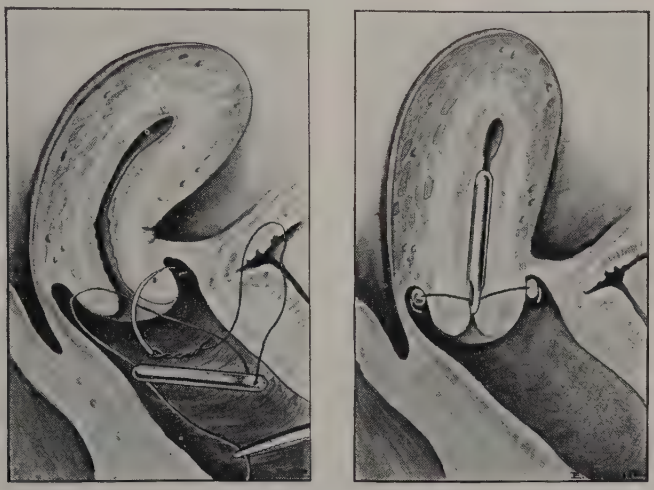
Fig. 5515.—The Same _ III; _ The finally sutured wound. An object which should be sought in cases where the lacerations are accompanied by marked cervical hypertrophy is to include enough cervical tissue in each of the four areas excised to materially lessen the size of the cervix (which is not particularly shown in this series of pictures).

child will tend to both relieve and distribute tension (Fig. 5513). Such cases must be considered upon their individual features. It will often be better, especially if marked hypertrophy accompany the condition, to do a partial amputation of the cervix. If the position of the laceration be such as to make it possible, the case may sometimes be converted into one of the usual type of bilateral laceration (above described) _ by advantageously cutting two nearby lacerations into one by V-shaped excision _ thus making three lacerations into two V-shaped wounds to be sutured _ or four, into two such wounds _ as shown in Fig. 5512.

In multiple lacerations of minor grade, as in Fig. 5513, it may sometimes be possible to excise the scar tissue of the wounds in the manner shown in Fig. 5514 _ and then bring together the opposite faces of the wounds in the manner shown in Fig. 5515 (also v. Fig. 5514 for placing of the stitches).

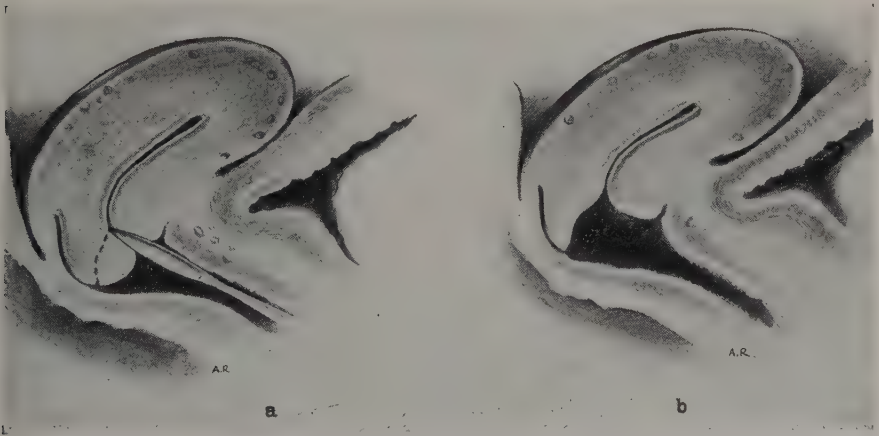
INTRAVAGINAL OPERATIONS FOR ANTEFLEXION OF THE UTERUS

Anteversion and anteflexion of the uterus, within limits, are normal – it is only symptom-producing anteflexion which is here considered – the chief



Figs. 5516 and 5517.—Operation for Anteflexion by Dilatation of the Uterocervical Canal, Followed by Prolonged Wearing of an Anchored Stem-pessary: – a, The placing of the retention sutures through the anterior and posterior cervical lips preliminarily to the introduction of the stem-pessary; – b, the pessary in position, held in place by shots clamped upon the emerging ends of the sutures (which is preferable to any method of tying in the sutures).

manifestations of which calling for operation are dysmenorrhea and sterility. Several procedures have been evolved.



Figs. 5518 and 5519.—Operation for Anteflexion by Median Incision and Partial Excision of the Cervical Lip, Followed by Suture – Duley's Technic: – a, Sectional view of the area to be incised, to straighten the cervical canal; – b, the incision completed, showing a considerable degree of straightening of the canal.

Operation for Anteflexion by Dilatation and Curetage of the Uterocervical Canal.—These technical measures have been already described (v. pp. 233 and 240). They should be performed under anesthesia. They are

the simplest measures applicable _ and usually relieve a certain proportion of cases. General regimenal living contributes largely in these cases.

Operation for Anteflexion by Dilatation of the Uterocervical Canal, Followed by Prolonged Wearing of a Uterine Stem-pessary.—Dilatation is performed in the manner described at p. 233 and under anesthesia. Curetage is systematically avoided by some Operators _ in view of the necessity of wearing the foreign object subsequently, as the danger of sepsis is thereby increased. Other Surgeons also curet when it appears that this condition is indicated. A self-retaining, self-draining stem-pessary should, in the judgment of the Author be always employed. Some Surgeons employ a stem-pessary perforated at its lower end and double threaded _ one end being

Fig. 5520.—Operation for Anteflexion by Combined Median Incision and Partial Excision of the Posterior Cervical Lip, Followed by Suture _ and Tracheloplastic Denudation and Suturing of the Anterior Lip _ Dudley _ I; _ Surface view _ median division of the posterior lip from the opening to the vaginal attachment. The areas for cuneiform excision are dotted.

carried by a curved needle through the anterior, and the other through the posterior lip, and tied. The pessary should not be employed where inflammatory or infective processes are in operation _ and should be at once withdrawn if these or discomfort arise. It should be introduced only after unusually careful antiseptic preparation and during rigid asepsis, and subsequently should be periodically watched. It is probably better practice to hold the cervical pessary in place by a vaginal pessary than to suture the former into position, although such an additional instrument is cumbersome. The instrument should pass through the internal os and into the uterine cavity _ but not to its upper end. It is worn a varying length of time _ from several weeks to several months (sometimes up to six months) _ with occasional withdrawals if the total length of its use be long.

For those who prefer to suture the stem-pessary into position the technic is shown in Figs. 5516 and 5517.

Operation for Anteflexion by Median Incision and Partial Excision of the Posterior Cervical Lip, Followed by Suture – Dudley's Operation.—The uterocervical canal is cureted – and, while the os is seized, laterally, with tenaculum forceps, the posterior lip is medially split, from its origin to the vaginal attachment (Figs. 5518–5520). From the middle of each divided lip a wedge-shaped piece is excised, the base of which corresponds with the raw margin of each lip, and forms about one-third of its length (Fig. 5521). The suturing is then accomplished as shown in Figs. 5521 and 5522 – the somewhat complicated stitch tending to fold together the two sides of the margins represented by the two small cuneiform excisions, after which it draws down the upper third of each side of the original incision to the bottom of that incision – approximating the parts as seen in the illustration. Additional sutures are placed as there shown.

The median incision divides the internal os. When the vaginal junction is reached, the knife or scissors, making the original incision, is replaced by a

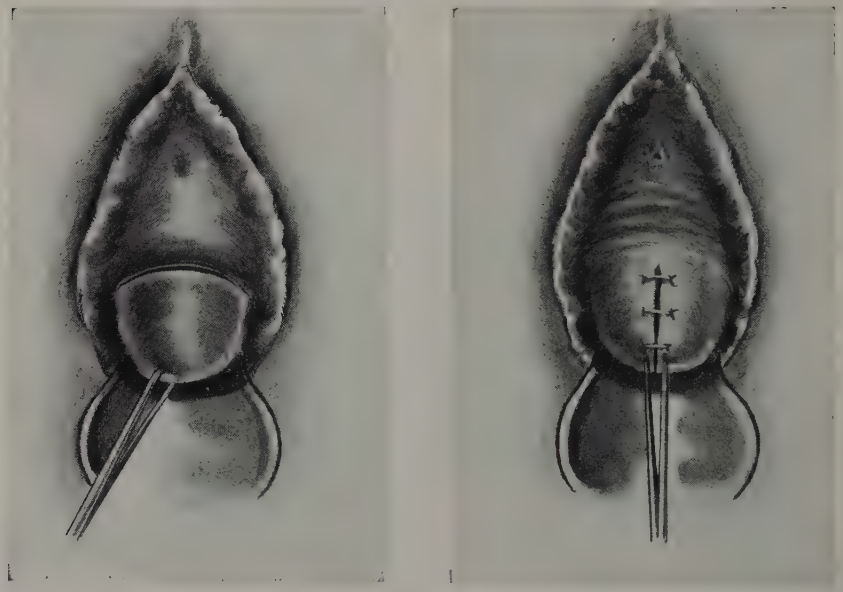
Figs. 5521 and 5522.—The Same – II and III: – **a**, The small wedge of marginal tissue has been cut from the middle of each lip – and the special suture has been placed in the manner shown, and will close together the sides of the wedge, and approximate the uppermost third of each raw lip, to the bottom of the median incision; – **b**, the special suture is tied – and two additional sutures, on each side.

narrow, straight bistoury, which is carried through the internal os, under the guidance of a finger passed along the already made opening – and the constriction at the internal os is divided, being careful not to cut through the uterus into Douglas' peritoneal pouch.

Operation for Anteflexion by Median Incision and Partial Excision of the Posterior Cervical Lip, Followed by Suture – Dudley's Operation – **Reinforced by Tracheoplastic Denudation and Suturing of the Anterior Lip** – Reynold's Modification.—The operation upon the posterior lip is performed exactly as just described. After thereby forming a new external os at a higher level, and constructing a straighter, shorter, larger cervical canal, the cervix may be thrown still further backward, and the angle between the cervix and anterior uterine wall lessened by adding the present technic – which is carried out as follows: – Drawing the anterior lip downward, a transverse incision is made over its face about 1.8 cm. ($\frac{3}{4}$ inch) in length, through the mucous membrane just above the cervicovaginal junction (Fig. 5523) –

after which the connective tissue intervening between the vagina, on the one hand, and the bladder and uterus on the other, is separated by blunt dissection and displaced upward for about 1.3 cm. ($\frac{1}{2}$ inch) in the center and at the sides of the wound – with, as a result, freeing of the vaginal attachment and of the vesical and uterine as well – which help to hold the angularity constituting the anteflexion. Finally, the vaginal incision, which was made transversely, is so sutured, by transversely placed sutures, as to be closed longitudinally (Fig. 5524).

Operation for Uterine Anteflexion by Ureteroplastic Technic Through a Posterior Vaginoperitoneotomy Incision – Doyen's Technic. —This operation is the reverse of Doyen's procedure for retroflexion. The elongated posterior uterine wall is exposed through the posterior vaginal fornix and shortened by suture.



Figs. 5523 and 5524.—Reynold's Reinforcement of the Dudley Operation for Anteflexion – by Tracheloplastic Denudation and Suturing of the Anterior Lip; – I, – The transverse incision just above the cervicovaginal junction; – II, The transversely made wound sutured into a longitudinal closure.

Operation.—The same general technic which is applied for retroflexion through the anterior vaginal fornix (v. p. 275) is here applied for anteflexion through the posterior fornix. The uterorectal peritoneal pouch is incised as in ordinary posterior vaginoperitoneotomy, and the uterus delivered into the vagina. The upper sutures are transversely inserted as high as possible into the posterior wall of the uterus – and the lower, from 15 to 20 mm. further down, near the vaginal insertion. The first suture is usually reinforced by a second outlying suture. The vaginoperitoneal wound is closed as usual.

The uteroplastic sutures in these operations are of coarse silk.

Intra-abdominal operations for anteflexion will be considered in Chapter XCII (q. v.).

OPERATION FOR UTERINE RETROFLEXION BY UTEROPLASTIC TECHNIC THROUGH ANTERIOR VAGINOPERITONEOTOMY INCISION

DOYEN

Description.—The principle of the technic here employed is that of shortening, by suture, the elongated anterior uterine wall, by exposure through the anterior vaginal fornix.

Operation.—The cervix is seized upon each side by a clamp forceps, and drawn downward and outward. The organ hitherto curved anteriorly is, under this extension, straightened. The anterior vaginal fornix is then opened transversely as in ordinary anterior vaginoperitoneotomy – while the cervix is still drawn downward and depressed, and the anterior vaginal structures are held forward by retractor. The bladder is freed by blunt dissection from its cervico-uterine connections, and pushed, and held upward – and the vesico-uterine peritoneal pouch incised. The uterus is then further delivered into the vagina by traction upon two clamps. Two buried silk sutures are now placed. The first suture passes, as high as possible, transversely into and out of the uterine wall, above – and into the neck of the uterus below, just above the vaginal portion of the cervix. The upper level of the suture passes just above the peritoneal reflection upon the uterus. This suture is then tied – the act of tying straightening the uterus by bringing the upper and lower limits of the suture into contact. This first stitch is reinforced by a second suture, similarly placed, just outside of the first. The vaginoperitoneal incision is then closed in the usual manner.

OPERATION FOR UTERINE RETROFLEXION BY UTEROPLASTIC TECHNIC THROUGH ANTERIOR VAGINOPERITONEOTOMY INCISION

REED

Description.—The operation utilizes the same principle employed in Doyen's corresponding operation, except that a definite depth of the anterior

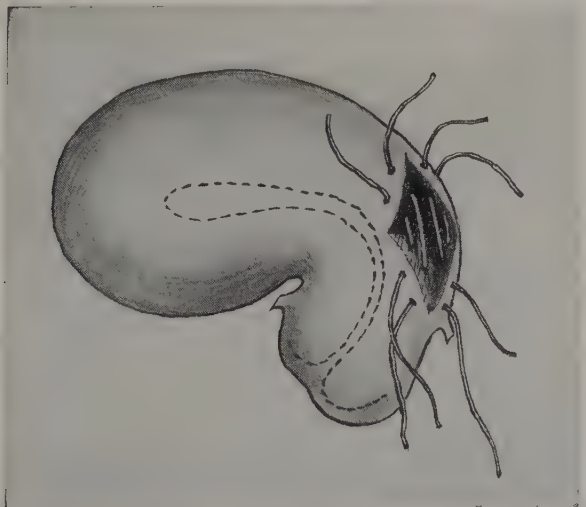


Fig. 5525.—Operation for Uterine Retroflexion by Urethroplastic Technic Through Anterior Vaginoperitoneotomy Incision – Reed – The diamond-shaped area of excision from the anterior supravaginal uterine wall is shown – with the axially placed sutures in position, ready to approximate the upper to the lower half of the wound (not the right to the left side).

uterine wall is excised _ after which sutures are inserted to approximate the upper and lower ends rather than the sides of the uterine incision.

Operation.—The first steps of the operation are precisely the same as those in the Doyen technic (v. p. 275). An elongated diamond-shaped area of the anterior uterine wall is then excised down to but not including the mucosa _ the length and width of the area depending upon the grade of involvement. The upper right half of the uterine wound is then sutured to the lower right half _ and the upper left half to the lower left half (Fig. 5525). When these sutures are tied their tendency is to straighten out the body of the uterus in line with the cervix.

REMOVAL OF BENIGN TUMORS OF THE UTERUS BY THE VAGINAL ROUTE

Varieties of Uterine Tumors.—The forms of tumors most frequently encountered are:

(1) **Benign.**—Polyps (represented by hypertrophy of the mucous membrane) _ Myoma (in which the muscular tissue predominates) _ Fibroma (in which the fibrous tissue predominates) _ Fibromyoma (in which fibrous and muscular tissue are prsent) _ Adenomyoma (consisting of myomatous development, with the presence of gland elements).

(2) **Malignant.** — Carcinoma _ Sarcoma _ Chorio-epithelioma malignum (malignant tumor of the epithelial elements of the placental tissue).

As to Position.—Uterine tumors may be of the Cervix _ or of the Body of the organ; _ and may be submucous _ Intramural (Interstitial) _ or Subserous (Subperitoneal).

Routes and Methods of Removing Benign Tumors of the Uterus:

(*a*) **Removal by the Vaginal Route Through the Undivided Cervico-uterine Tract.**—Chiefly applicable to polyps and to more or less pedunculated submucous fibromyomata.

(*b*) **Removal by the Vaginal Route Through the Divided Cervico-uterine Tract Extraperitoneally.**—The tumor being exposed by anterior or posterior colpotomy, followed by extraperitoneal hysterotomy _ Chiefly applicable to large pedunculated tumors, to sessile submucous tumors, and to intramural tumors.

(*c*) **Removal by the Vaginal Route Through the Divided Vagina and Peritoneum and Through the Partly Divided and Temporarily Displaced Uterine Wall.**—The tumor being exposed by anterior or posterior colpotomy, followed by peritoneotomy (celiotomy), and incision of the uterus, forwardly displaced, temporarily, into the vagina _ Chiefly applicable to pedunculated and non-pedunculated tumors of the body of the uterus, which are not reasonably removable by either of the preceding methods _ nor grave enough to require the following method. This technic is described in Chapter LXXXIX (v. Contents).

(*d*) **Removal by the Abdominoperitoneal Route.**—The approach is usually by median abdominal section; _ Chiefly applicable to the maximum grade of tumors of the body of the uterus (especially intramural and subserous), and in connection with coexisting complications. This technic is described in Chapter XCII (v. Contents).

General Indications for the Removal of Benign Tumors.—Anemia _ pain _ pressure-symptoms _ adhesions _ interference with circulatory and intestinal flow _ the association (in 5 per cent. of cases, according to Lockyer) of fibromyomata with malignancy.

Special Indications for Simple Vaginal Fibromyomectomy (Without Opening the Peritoneum).—Infected and sloughing submucous tumors (which

might furnish a source of peritoneal infection through an intra-abdominal operation) _ single, submucous fibromyoma, not too large (Noble giving the limit of from 6 to 8 pounds, and a diameter of 12 cm., or $4\frac{3}{4}$ inches) _ cervical or uterine polyps _ single, intramural fibromyoma, of moderate size, situated low in the anterior uterine wall _ cervical fibroids of moderate size.

Intramural tumors of moderate size, situated higher up, and subperitoneal tumors of moderate size, removed by the combined vaginal and peritoneal routes, will be described in Chapter LXXXIX (v. Contents).

Contraindications to Simple Vaginal Myomectomy (Without Opening the Peritoneum).—Multiple tumors _ small or virginal vagina _ large or complicated single tumors _ and, according to some Surgeons, intramural and subperitoneal tumors (these Operators holding that only pedunculated submucous fibromyomata should be removed by vaginal myomectomy).

Varieties of Technical Procedures for the Removal of Benign Tumors of the Uterus by the Vaginal Route.—Removal of polypoid tumors of the uterus by curetage _ Removal of moderate size pedunculated tumors of the uterine cavity wall by écraseur _ Removal of pedunculated intra-uterine tumors by torsion _ Removal of pedunculated intra-uterine tumors by ligation and section _ Removal of pedunculated intra-uterine tumors by temporarily retained clamp and section _ Removal of moderately large submucous uterine myomata projecting into the vagina by bisection of the tumor, followed by ligation or clamping _ Removal of moderately large submucous fibromyomata projecting into the vagina by unilateral or bilateral division of the cervix _ Removal of large submucous myomata by twofold excision _ Removal of large submucous uterine myomata by morcellation after unilateral or bilateral division of the cervix _ Removal of submucous and intramural uterine fibromyomata by enucleation _ Removal of a fibromyomatous or polypoid tumor protruding from the cervical canal by enucleation.

Operations for malignant tumors of the cervix are considered later in this chapter _ and, of the body of the uterus, in Chapter LXXXIX.

General Preparation.—As for Vaginal Operations, in General (v. p. 124).

Position.—The same.

Landmarks.—Determined by the nature and position of the special tumor, as learned by preliminary investigation.

Analgesia _ Anesthesia.—The minor procedures, especially upon tumors of the cervical canal and cervix, may require no form of deadening or an injection of novocain _ while the major procedures will require anesthesia.

Removal of Polypoid Tumors of the Uterus by Curetage.—Only comparatively small tumors are removed by curet _ and, when thus removed, it is usually more a matter of accident, as in the routine of curetage (Fig. 5526) than by deliberate intent. It is always by accident, in the case of small tumors of the mucosa of the body of the uterus, where their presence would not be detected unless the pedicle of the tumor be long enough to allow the lower end of the tumor to present itself at the os or in the cervical canal. In the case of polyps of the mucosa of the cervical canal they may sometimes be deliberately detected upon examination. Polyps deliberately attacked are best removed by a sharp curet _ though a dull curet will often suffice to break the frail pedicle _ and may, indeed, be followed by less hemorrhage. If hemorrhage follow, an application of adrenalin solution should be made to the site of the divided pedicle of the small tumor or tumors.

Removal of Moderate Sized Pedunculated Tumors of the Uterine Cavity Wall by Écraseur.—This method of attacking pedunculated intra-uterine tumors was formerly much in vogue _ and is still a valuable and simple

method in appropriate cases. For its application, however, it is necessary that the tumor be comparatively small – and it is a *sine qua non* that its pedicle be reachable by the wire of the écraseur – which is difficult or impossible if the expanded portion of the tumor block the way to its pedicle – especially if its lower aspect serves as a ball valve, blocking the passage through the cervical canal. There must be sufficient patulousness of the passages around about both the bulk and the pedicle of the tumor for the conduction of the wire of the écraseur up to the portion of the pedicle (usually at its junction with the uterine wall) around which the constriction is to be applied. Some pedunculated submucous myomata not only block entrance to the uterus, but may even make it impossible to pass alongside of them through the vagina – some, indeed, even projecting as considerable tumors outside of the lips of the vagina.

Fig. 5526.—Removing Polypoid Tumors of the Uterocervical Canal by Curetage.

In applying this technic a loop of stout wire (usually piano wire or twisted wire, or, sometimes, articulated chain-saw wire), arranged upon the écraseur, is slipped around the lower aspect of the tumor, and is then slipped on up to its pedicle (Fig. 5527), when it is gradually tightened – until the tumor drops off. The gradual constriction of the neck usually controls bleeding from the pedicle. It is sometimes necessary to split the cervix in order to gain access to the uterine cavity. This is accomplished as when splitting it for purposes of examination or other operative manipulation (v. p. 253). If this be done, the cervix is repaired by suture at the end of the operation. If the tumor not only block the cervical canal but also the vagina, protruding beyond the latter, it may be necessary to make a vaginoperineal section to gain access for the application of this or some other technic.

The wire of the écraseur is now never employed, as was formerly sometimes done, to be tightened around the bulk of the tumor, and allowed to stay there until it had cut its way through, being tightened at intervals – and, later, be applied to the portion of the tumor higher up.

Removal of Pedunculated Intra-uterine Tumors by Torsion.—The application of this technic preargues the ability to seize the lower aspect of the tumor. The tumors to which the method is usually applied generally protrude partly through the cervical canal or even into the vagina. Their free, presenting portion is seized with fenestrated clamp forceps (usually of the hemorrhoidal type) – after which the tumor is twisted continuously in

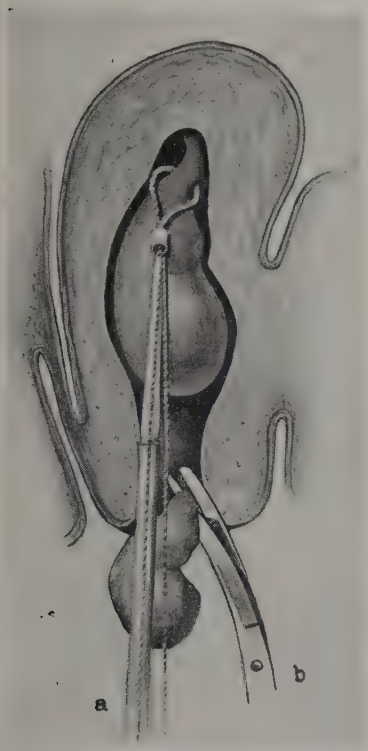


Fig. 5527.—Removal of Pedunculated Intra-uterine Tumors: – a, By écraseur; – b, by ligature and section.

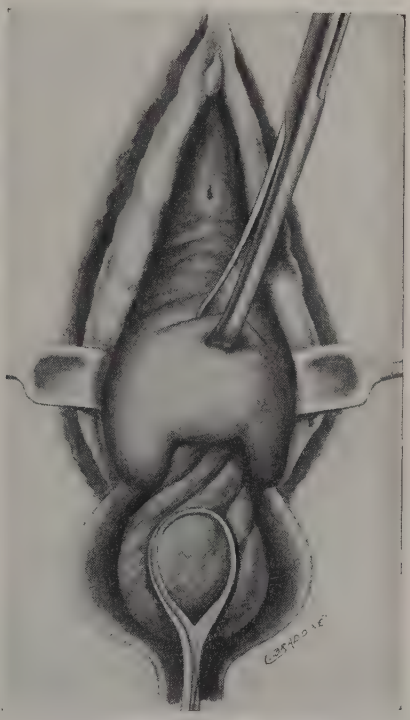


Fig. 5528.—Removal of a Pedunculated Intra-uterine Tumor by Torsion.

one direction, thereby carrying the twists up the pedicle – until the latter yields, usually at its thinnest or weakest site (Fig. 5528). No bleeding, as a rule, follows the coming away of the tumor (as, in twisting a divided artery of moderate size, no bleeding follows).

Removal of Pedunculated Intra-uterine Tumors by Ligation and Section.—This method is only available where the pedicle of the tumor is accessible – usually in small or moderate growths, especially where the attachment of the pedicle is within the lower part of the cervical canal. Nearer access to the part is secured by first drawing the cervix down with tenaculum forceps – and then gently practising traction upon the tumor – while the chromic catgut ligature is slipped up over the tumor until it is carried as

high up the pedicle as possible _ when it is tied _ and the pedicle divided below it (v. Fig. 5527, **b**).

Removal of Pedunculated Intra-uterine Tumors by Temporarily Retained Clamp and Section.—It will sometimes happen that although a ligature cannot be conducted over the tumor and along the pedicle, yet the blades of a pair of slender clamp forceps can. These blades may be carried up to, if not quite to, the attachment of origin of the pedicle, and are then clamped. After this a pair of curved scissors, stout but slender, are carried along the blades of the clamp _ and divide the pedicle between the clamps and the bulk of the tumor (Fig. 5529). The clamps are allowed to remain *in situ* for from twenty-four to forty-eight hours _ the neighboring parts being protected by

Fig. 5529.—Removal of Pedunculated Intra-uterine Tumors by Temporarily Retained Clamp and Section: _ Clamping the pedicle of the tumor, as high up as it can be reached _ and dividing the pedicle, with curved scissors, below the clamp. It will be seen that after the removal of the tumor the pedicle could probably be ligated and the clamps removed.

wrapping gauze about the outwardly projecting parts of the clamps _ and clamps with detachable handles are best for this purpose.

It will also sometimes happen that after the pedicle has been clamped and the pedicle then divided distally to the clamps, that such a degree of access is given to the pedicle by removal of the mass of the tumor that, contrary to expectation, a ligature can then, and only then, be applied to the pedicle _ which should be done if it can be done _ and the clamps be entirely removed.

Note.—It should be borne in mind _ in ligating, or clamping, or dividing any supposed pedicle of an intra-uterine tumor, especially under traction _ that the uterine wall, to which the pedicle of the tumor is attached, may be limitedly inverted by the act of traction (to which the drag of the tumor may have predisposed) _ so that it may not be humanly possible under such cir-

Fig. 5530.—Illustrating the Danger of Inverting the Uterine Wall by Traction Upon a Pedunculated Intra-uterine Tumor – and the Difficulty of Telling the Pedicle of the Tumor from the Double Wall of the Uterus; – Section at the solid line would be correct – but section at the dotted line would open the peritoneal cavity.

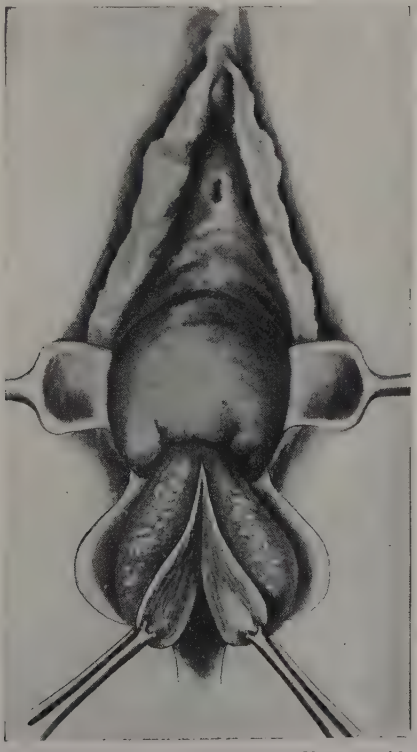


Fig. 5531.—Removal of a Moderately Large Submucous Uterine Myoma Projecting Into the Vagina – by Bisection, Followed by Ligation or by Clamping.

cumstances to tell just where the pedicle of the tumor ends in the uterine wall and where the beginning of the uterine inversion starts. The practical bearing of this is that if in such a case the supposed pedicle be ligated, clamped, or divided as in Fig. 5530, all will be well _ whereas, if at **b**, the peritoneal cavity will be opened by knife or scissors, or necrosed by clamp or ligature, or the bladder might be similarly involved.

Removal of Moderately Large Submucous Uterine Myomata Projecting Into the Vagina _ by Bisection of the Tumor, Followed by Ligation or Clamping.—Nearer access to the pedicle of such a tumor if it otherwise block the approach may sometimes be secured by medially splitting the tumor _ after which it may be possible to follow up the artificially made bipartite pedicle (Fig. 5531) until either each half can be ligated or clamped higher than otherwise possible _ or possibly even the common pedicle may be

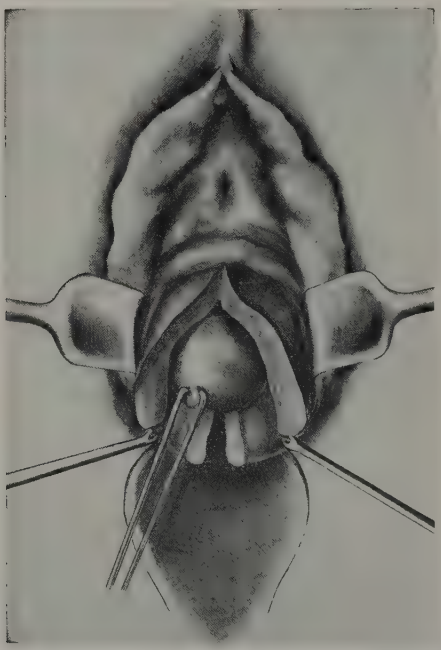


Fig. 5532.—Removal of Moderately Large Submucous Fibromyomata Projecting Through the Cervix by Anterior and Posterior Median or Bilateral Division of the Cervix.

thereby reached at a higher level _ or, as in the preceding method, after clamping or tying the half pedicles as high as possible, and getting rid of the bulk of the tumor by section just below the clamps or ligature, one may be able to then tie the common pedicle at the desired level.

Removal of Moderately Large Submucous Fibromyomata Projecting Into the Vagina by Unilateral or Bilateral Division of the Cervix.—It may be necessary to divide the cervix upon one or upon opposite aspects before sufficient access for manipulation can be secured _ as shown in Fig. 5532. The tumor is then generally removed either by ligation and division of the pedicle, or by incision of its capsule, followed by enucleation (v. p. 283).

Removal of Large Submucous Myomata by Twofold Excision _ Technic of Kelly and Cullen.—Approach to the pedicle is sometimes so completely interfered with by a tumor large enough to even distend the vagina

that until at least some of the tumor substance is removed no working room is available. A very clever method of twofold consecutive excision has been worked out by Kelly and Cullen – in which the main obstructing mass of tumor substance is gotten rid of by means of excising a large wedge-shaped piece of its tissue (Fig. 5533). If marked bleeding occurs from the resulting raw surfaces, the main portion of this may be controlled by temporary hemostats. Having gotten rid of the central portion of the tumor, and thereby lessening the bulk of the mass by at least one-third, the two sides may then be pressed together upon themselves so that the outer aspects of each side may be followed down to the pedicle – upon which is incised, upon first one side of the pedicle and then upon the other, an oval flap – the two wedge-shaped sections meeting in the midline of the pedicle – thereby freeing the remainder of the tumor – which is removed. The two small flaps are then sutured to-

Fig. 5533.—Removal of Large Submucous Cervical Myoma by Twofold Excision – Technic of Kelly and Cullen – I; – A large portion of the tumor, which chiefly blocks access to the pedicle, is first excised by a V-shaped section, to make room – and then a second, smaller V-shaped excision is made, the walls left by which will form two small oval flaps, to be sutured over the divided pedicle.

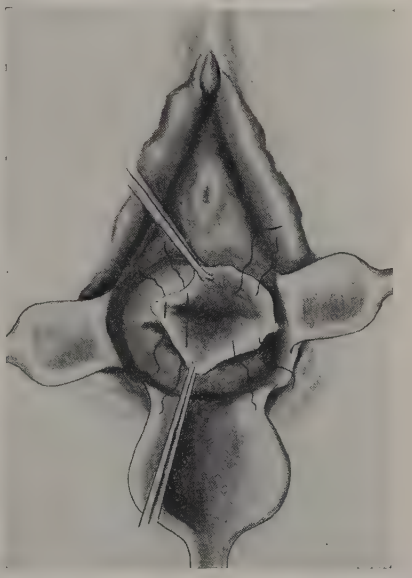


Fig. 5534.—The Same – II; – Following the second wedge-shaped excision the two resulting oval flaps are sutured over the base of the pedicle – by buried (on left) and by marginal stitches (on right) – leaving the cervical canal intact.

gether over the remnant of the pedicle of the tumor – first using buried sutures (in the case of moderately large pedicles and flaps), and, finally, marginal stitches (Fig. 5534).

Removal of Large Submucous Uterine Myomata by Morcellation After Unilateral or Bilateral Division of the Cervix.—This method was formerly much used – but is now less often employed. It consists in the digital or instrumental breaking up of the tumor mass and its piecemeal removal – after either dilating or, generally, performing median unilateral or bilateral division of the cervix. Lockyer writes: "The absolute indication for this operation (morcellement) is the sloughing, gangrenous, submucous myoma. The putrefactive portions of the growth which occupy the vagina, and sometimes protrude outside of the vulva, must be cut away with scissors; the upper, intrauterine part of the tumor often requires removal by first cutting up the growth

piecemeal with Segond's instruments. Splitting the cervix is sometimes necessary before a submucous sessile tumor can be enucleated or before morcellement is possible." The method, however, has been often employed for other than broken-down tumors. Abel writes: "He who can control the vaginal method to the greatest possible degree can, by morcellement, vaginally remove tumors which are scarcely considered possible. It is not right to say that only myomata which extend to the umbilicus should be attacked vaginally and that larger tumors should be removed abdominally. This depends on the size of the vagina, the motility of the tumor, and the skill of the operator. There is no doubt that the vaginal operation, even if it lasts longer because of a protracted morcellement, constitutes a much less dangerous at-

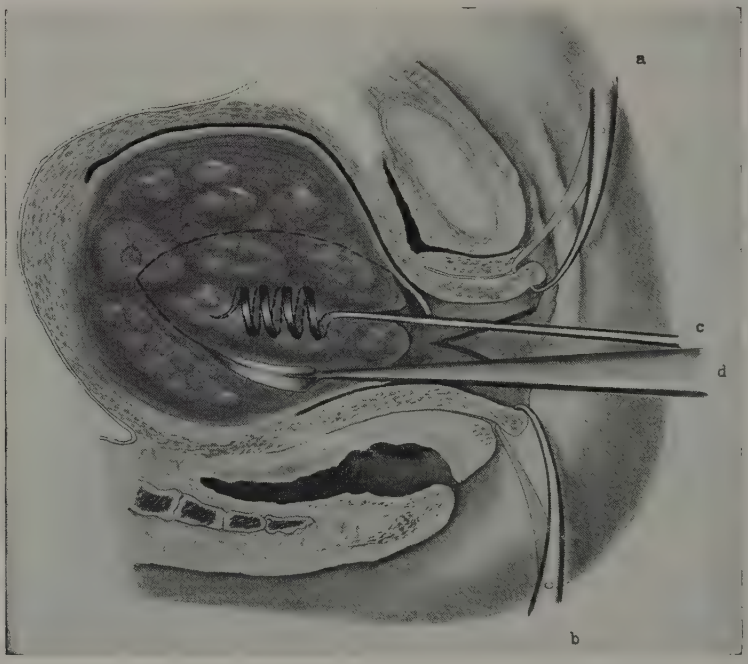


Fig. 5535.—Removal of Large Uterine Myomata by Morcellation After Unilateral or Bilateral Division of the Cervico-uterine Canal: a and b, Tractors upon the anterior and posterior lips of the bilaterally split cervix; c, Segond's myoma-corkscrew, bored into the center of the submucous myomatous mass, from the presenting aspect of which the incised mucosal covering has been pushed aside; d, Segond's lanceolated myoma-knife, conically encircling the portion of the myoma into which the myoma-screw has been inserted, the sides of the section meeting beyond it, and making an opening into the tumor mass for the beginning of the morcellation.

tack than the abdominal operation." Thus one reads two views tending toward extremes, a midground, as usual, probably being more nearly correct. Two special technics are used.

Segond's method of morcellation:

The patient is in the dorsal posture, with the perineal and vaginal walls retracted as indicated in the special case. The cervix is seized by vulsellum forceps and drawn into the field. Approach to the uterine cavity, sufficient for the necessary manipulation, is secured by an anterior median division of the cervix, or a unilateral or a bilateral division, according to the judgment of the Operator, and the particular features of the case. In performing

median hysterotomy the bladder and peritoneal reflections are carefully pushed upward well out of the way after incising the anterior vaginal fornix. In unilateral or bilateral hysterotomy the division is made up to the isthmus – and, if more room be needed, Segond advises continuing the incision higher – guarding against cutting through the whole thickness of the uterine border – and carrying the incision higher upon the inner than upon the outer aspect so as to avoid the uterine artery. The dimensions of the upper aspect of the

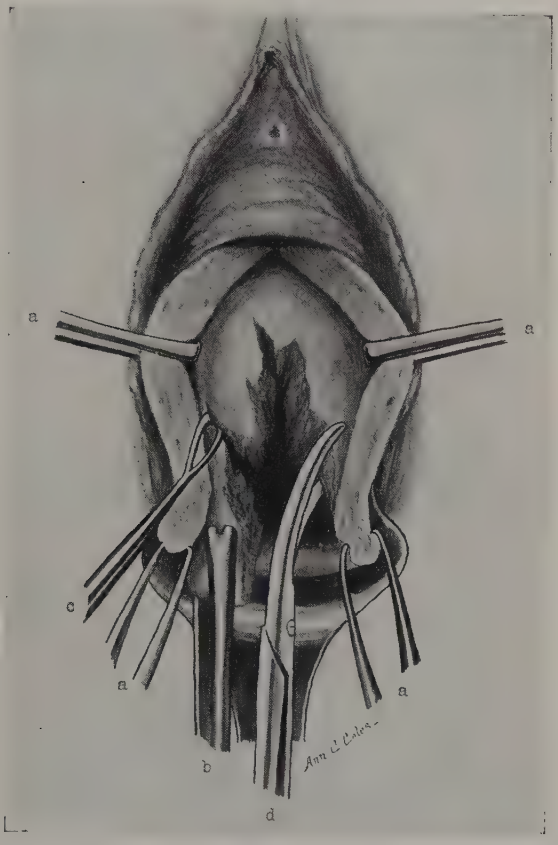


Fig. 5536.—Removing a Uterine Submucous Myoma by Morcellation Through an Anteriorly Split Cervico-uterine Canal; – The center of the tumor mass has been removed – whether by digital manipulation or by Segond's instrumentation – and the peripheral portion of the tumor is being now excised piece-meal. Pieces are being broken off by a blunt dissector, c, while the fragment is being drawn upon by clamp forceps, b – and other portions are being cut away by blunt-pointed scissors, d; a, a, a, a, tenaculum forceps are drawing apart the walls of the split uterus – which is here represented divided unusually and unnecessarily high for the purpose of demonstrating the different technics.

opening may be eventually increased by digital and other blunt dissection. Unless the presenting tumor block the way, a digital investigation of the intra-uterine condition should be made while the uterus is drawn well downward. If the Operator be convinced that he can break up the tumor by finger, so much the better – and safer. Contact with the tumor itself is only secured after the overlying mucous membrane is divided – either with the finger-nail or by instrument. The mass of the tumor is then broken up into detached or semidetached fragments by the finger, and are removed by finger or by for-

ceps. Or the mass may be attacked with morcellation forceps, and broken up by them, and removed. If these measures fail, one may resort to the technic of Segond. If the mass be large and well steadied in its position, Segond's corkscrew alone may be used _ otherwise it is well to first steady the tumor mass with Museux's clamp forceps. A careful calculation must be made, and this is a matter of judgment, in using the corkscrew _ that it be carried into the center of the mass _ and that it do not penetrate through and beyond, into, if not through, the uterine wall. When the corkscrew is well engaged Segond's long-handled, lanceolated knife is most carefully carried into the mass of the tumor, around the corkscrew, very much as one "cores" an apple (Fig. 5535) _ the sides of the section meeting, cone-like, beyond the point of the corkscrew _ the revolving of the knife around the corkscrew, which serves the double purpose of guide and tractor, scoops out the center of the tumor. In large tumors the corkscrew may be again applied, followed by the knife. Finally, upon withdrawing these instruments the rest of the morcellation is accomplished by finger, blunt scissors, morcellation forceps, scoops, and the like (Fig. 5536), being careful to recognize the uterine wall as the outside limit of instrumentation _ the split lips of the cervix being well retracted the meantime. By seizing a semiloosened mass with clamp forceps (Fig. 5537), and

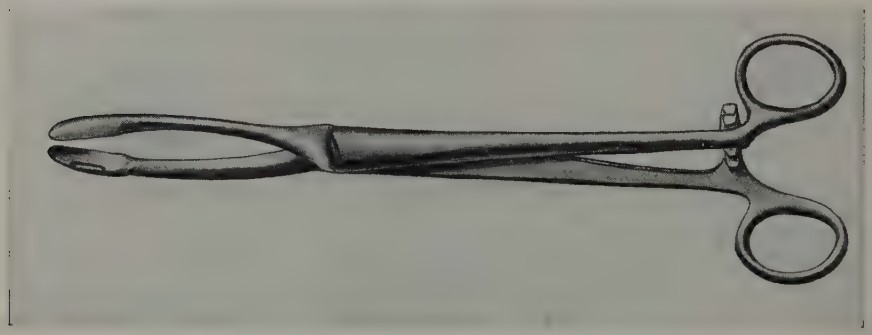


Fig. 5537.—Doyen's Morcellation Forceps.

twisting it from side to side, one may often thereby recognize the cleavage line between uterine wall and tumor _ which is the rallying-point of safety throughout the operation. If bleeding continue, which is exceptional, after the uterus is emptied the cavity should be temporarily packed with strips of gauze. One should make sure, or as sure as possible, that the uterine wall has been nowhere penetrated. Finally, the divided cervical lips should be carefully repaired by buried and superficial chromic catgut sutures.

Doyen's Method of Morcellation: Approach to the uterine cavity is secured, after incising the anterior vaginal fornix and displacing the bladder upward through an anterior hysterotomy made either in the form of a V (in cases where the cervix has been effaced, through the growth of the tumor), or in the form of a Y (where the cervix is not yet effaced). The angular flap resulting from either of these incisions is then retracted upward, exposing the antero-inferior aspect of the intra-uterine tumor _ after which Doyen's "corer" is applied to the tumor in what is considered a safe axis, and is carefully and guardedly made to cut its way into the tumor mass, while the uterus is steadied by pressure over the abdominal wall (Fig. 5538). When the "corer" is withdrawn the cut-out cylinder of tumor substance is removed with forceps _ leaving a tunnel with a blind end in the center of the tumor (Fig. 5539). The tumor is then removed by means of special cutting forceps, the

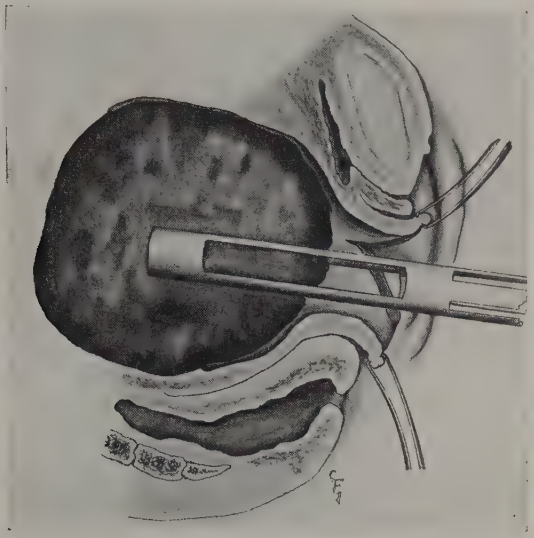


Fig. 5538.—Doyen's Method of Morcellation of Uterine Myomata – I; – Boring a tunnel into the center of the tumor for the beginning of the morcellation.

Fig. 5539.—The Same – II; – The anterior flap retracted – the boring completed – in readiness to begin either method of morcellation.

ends of whose blades are so protected that the uterine wall is not damaged – one blade being inserted into the tunnel just made and the other blade being carried in the exposed cleavage line between the tumor and the wall of the

uterus _ a portion of the tumor being cut in a straight line when the blades of the instrument are closed _ and the process is repeated, in different directions, until the tumor mass has been cut into small pieces and removed. Two methods of accomplishing this are employed: _ (*a*) Morcellation by Excision of Lozenge-shaped Pieces of Tumor (Morcellement Losangique _ Fig. 5540): The two lower sides of the lower median lozenge are cut _ this is grasped by clamp forceps and drawn down _ and then the two upper sides are cut _ thus removing the entire lozenge. Corresponding manipulations, modified to suit the position of each segment, is applied to each of the other lozenges in turn _ those in contact with the anterior, posterior, and lateral walls of the uterus. It often happens that after the lower lozenges are removed piecemeal much of the adjacent tumor substance can be brought away *en masse*. (*b*) Morcellation by Excision in Step-ladder Form (Morcellement par Devidement en Echelle _ Fig. 5541): _ This method is generally applied to tumors of somewhat

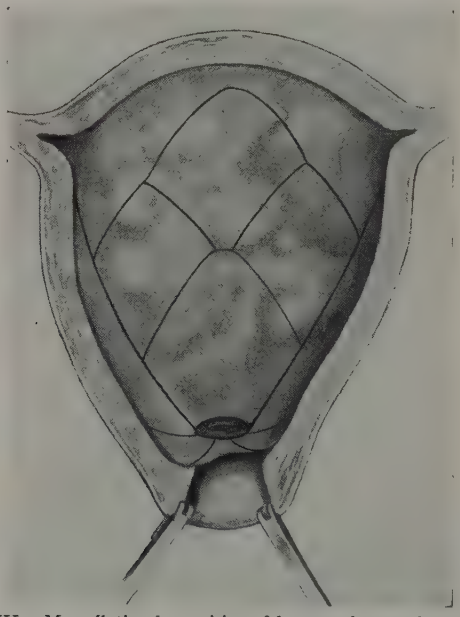


Fig. 5540.—The Same _ III; _ Morcellation by excision of lozenge-shaped pieces of tumor (Morcellement Losangique) _ lines indicating the lozenge-shaped blocks to be removed. (See text.)

smaller size than those in connection with which the preceding method may be used. The two limbs of a V are first made _ each limb beginning at the outer limit of the outer opening of the bored tunnel, extending thence upward and outward toward the fundus of the uterus. This T-shaped mass of tissue is then seized and drawn downward, and is consecutively incut, upon alternate sides, as the ribbon-like strip is pulled downward (Fig. 5542). This process is repeated upon different aspects of the uterus _ until the cavity is emptied of its contents in strips _ or until, finally, the upper portion of the tumor can be delivered *en masse*. Finally, the incised uterine wall is repaired by buried and superficial stitches _ and the wound in the anterior vaginal fornix temporarily drained.

Removal of Submucous and Intramural Uterine Fibromyomata by Intravaginal Enucleation.—The method about to be described more distinctly represents the process of enucleation _ although removal of myomata

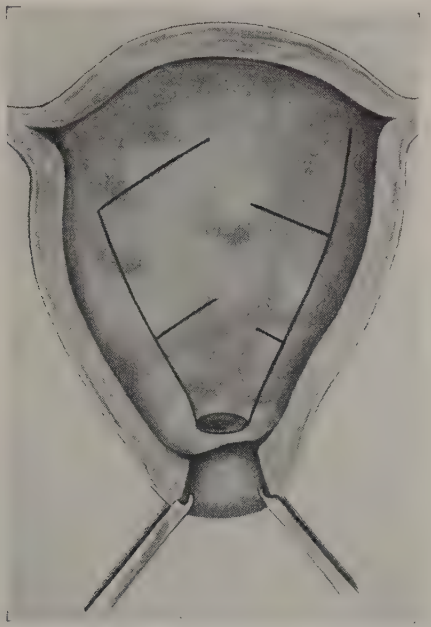


Fig. 5541.—The same—IV;—Morcellation by excision in step-ladder form (Morcellement par Devidement en Echelle)—lines indicating step-ladder incisions.

Fig 5542.—The Same—V;—Traction upon the end of the incised tract—drawing out a ribbon-like piece of tumor tissue.

by morcellation is, indeed, one method of enucleation. The procedure as applied to different localities will be described.

Removal of an Intramural Fibromyoma of the Cervix by Enucleation: – The lateral aspects of the cervical lips are seized with tenaculum forceps, and while the uterus is thus drawn downward, a transverse incision is made through the mucosa of the anterior vaginal fornix, cutting down upon the cervix – and, through the incision thus made, the bladder is carefully separated, by blunt dissection, from the anterior aspect of the cervix and lower part of the uterus, and from the vagina, and displaced upward and held out of the way by a retractor. If fuller access be necessary in freeing the parts, a vertical incision, extending up the anterior vaginal wall, may be added to the trans-

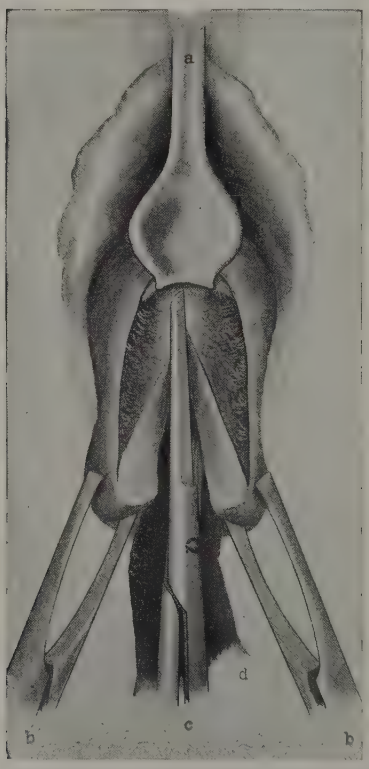


Fig. 5543.—Splitting the Cervix Anteriorly for Exposure of the Uterine Cavity: – a, Retractor of the bladder; – b, b, retractors of the split cervical lips; – c, division of the anterior cervico-uterine wall; – d, finger within the cervico-uterine canal.

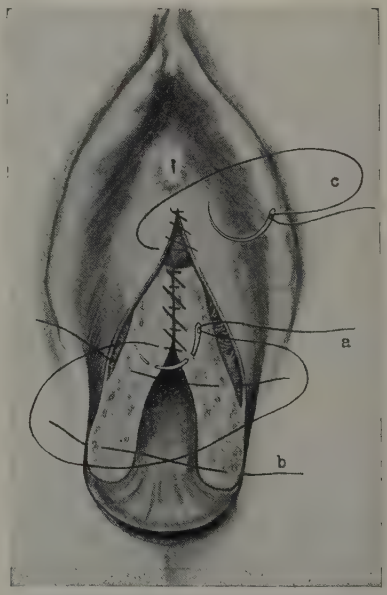


Fig. 5544.—The Same – I; – Closure of the wound: – a, Buried, non-penetrating sutures of the deeper portion of the divided uterine wall; – b, sutures of the outer aspect of the uterine wall; – c, suture of the vaginal wall.

verse one. The uterovesical reflection of peritoneum is also upwardly displaced. Those cases in which the peritoneum must be incised for the necessary manipulations come within the category of operations described in Chapter LXXXIX. Usually sufficient room can be secured for the removal of a tumor within the cervix, or lower part of the uterus, by carrying the incision of, or division of the cervix up to, or just above the internal os, and without opening the peritoneum (Fig. 5543). In some stage of this incision, prior to passing into the cervical canal, will an intramural tumor of the anterior lip of the cervix usually be encountered – although the complete division of the lip may be necessary if the tumor encroach upon the uterine

body. As soon as the tumor is exposed and its capsule is cut through the tumor itself is seized with volsellum forceps and either shelled out of its bed by the finger (enucleated), or a blunt dissector, or by curved Mayo scissors, using the latter both to cut connecting bands and as a lever. At the end of the operation the cavity from which the tumor was removed is closed by buried sutures (Fig. 5544). The vaginal wound is also sutured – usually making provision for temporary drainage of the latter.

If the tumor be within the posterior wall of the cervix instead of in the anterior, as above considered, the same general method of procedure is carried out, treating the posterior fold of peritoneal reflection in the same manner as

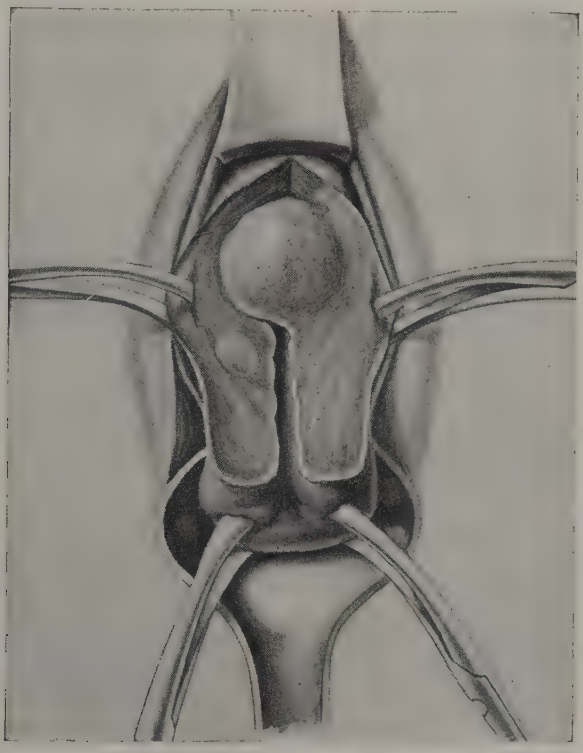


Fig. 5545.—Removal of an Intramural Fibromyoma of the Lower Part of the Body of the Uterus by Intravaginal Enucleation; – The vaginal mucosa of the anterior fornix has been opened by a median or an inverted T-shaped incision, and the bladder and peritoneum displaced upward – after which the cervix has been medially split up to or just beyond the internal os – until the tumor is exposed, which is then enucleated.

just described for the anterior peritoneal reflection – or access to the posterior lip may be secured after medially dividing the anterior lip.

Removal of an Intramural Fibromyoma of the Lower Part of the Body of the Uterus by Intravaginal Enucleation: – This operation is, practically, an upward continuation of the technic just described – and, because of the greater inaccessibility of the parts, the higher the situation of the tumor, correspondingly more difficult. The initial incision is freerer and the retraction of the parts is greater. A simple incision into the cervical tissue does not ordinarily suffice. The cervix is medially divided, and the split lips retracted by volsellum forceps – until the lower aspect of the body of the uterus is

reached, and the incision continued down upon the tumor, or through the wall of the uterus, until the tumor is encountered. The likelihood of having to open the peritoneal pouch is here even greater than in operating upon tumors limited to the cervix (v. Chapter LXXXIX). The tumor is finally reached and enucleated by combined sharp and blunt dissection (Fig. 5545). The wound in the uterine wall is closed by buried and superficial stitches – and the incised vaginal mucosa is closed up to the exit of a temporary drain.

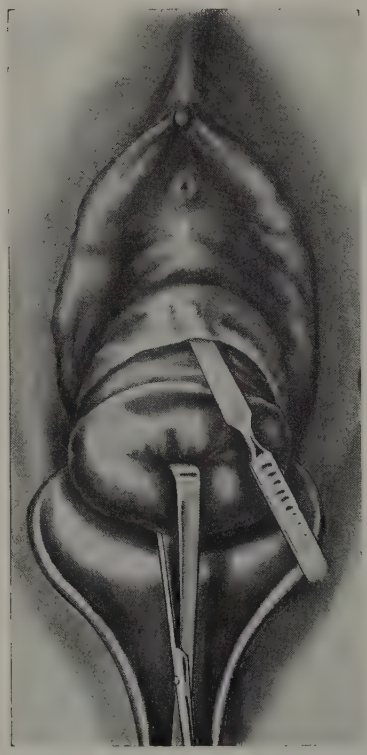


Fig. 5546.—Removal of a Fibromyomatous or Polypoid Tumor Protruding from the Cervical Canal by Enucleation – I; – The capsule has been incised around the greatest girth of the tumor, and is being freed from the underlying tumor by blunt dissection. A wedge-shaped piece of the tumor, as indicated by dotted lines, may be excised during the process of enucleation, to secure additional room for manipulation. (Figs. 5546–5549 modified from Bonney.)

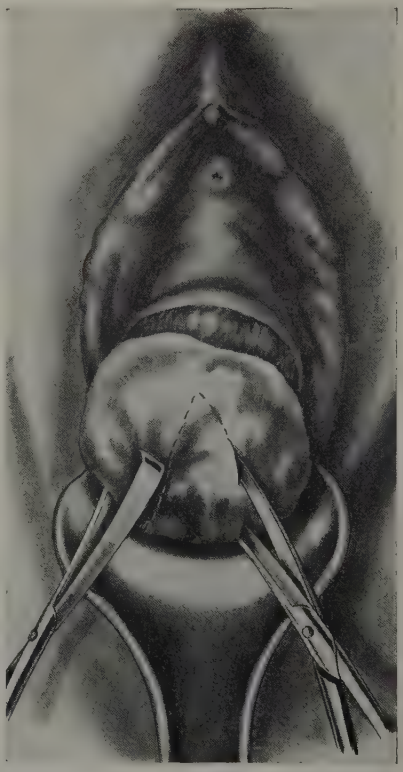


Fig. 5547.—The Same – II; – The partially freed tumor is being removed from the rest of its attachments by combined torsion within its capsule and by morcellation – the latter being here shown in the form of angular excisions.

If the tumor be of the posterior wall, the anterior incision just made will only serve as a means of reaching the inner aspect of the posterior wall – which must then be incised for the liberation of the tumor.

Removal of a Fibromyomatous or Polypoid Tumor Projecting from the Cervical Canal by Enucleation.—The capsule of the tumor may be circularly incised at its greatest periphery – after which the capsule is freed from the underlying tumor by blunt dissection by means of a blunt elevator, or the finger, carrying on the separation as high up as possible (Fig. 5546).

If the tumor is not removed by the time that the separation has gone as far as feasible at this stage, one of two methods may be resorted to:—The tumor, which is usually pedunculated, may be twisted upon its pedicle within the separated capsule (v. Fig. 5528)—until it comes away. Or room for higher manipulation may be obtained by excising a central portion of the tumor which has been separated from its capsule (Fig. 5547). When this has been done, and while the rest of the tumor mass is being drawn well downward, the finger, or blunt dissector, can be inserted considerably higher, in the plane

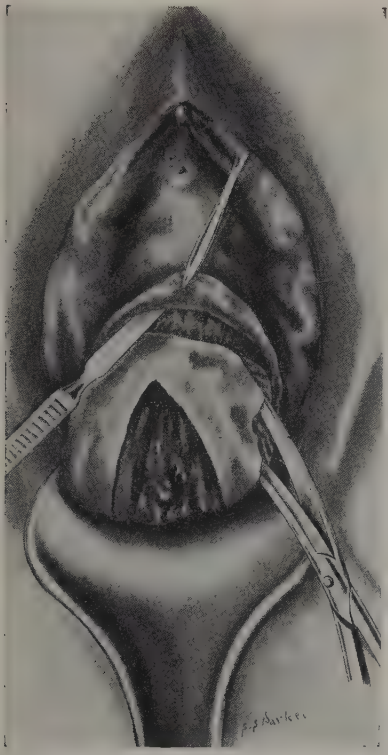


Fig. 5548.—The Same—III;—If the method of torsion within the capsule be not practised, the portion of the tumor remaining, after the excision of a wedge-shaped piece, is freed within its capsule by carrying the blunt dissection still higher up within the uterus.

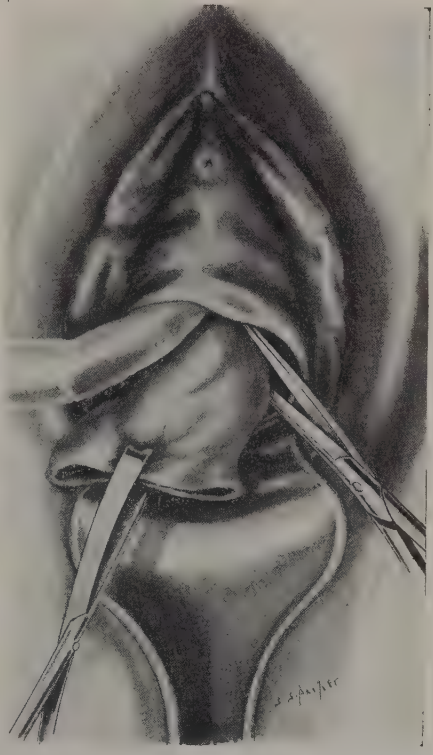


Fig. 5549.—The Same—IV;—Finally, the capsule from which the tumor has been enucleated is itself enucleated.

between tumor and capsule, which has been made roomier by the partial removal of the tumor mass—or the tumor may be cut away in pieces (Fig. 5536). Finally, the entire tumor is removed from its capsule—leaving the empty capsule protruding from the cervix. This is then seized, in turn, and dissected or twisted from its bed (Fig. 5549).

PALLIATIVE MEASURES IN CANCER OF THE CERVIX UTERI

The operation for cancer of the uterus is the Radical Operation—the wide removal of the entire uterus (vaginal, or abdominal hysterectomy), together with the removal of its lymphatic connections, through which dissemination

is likely to occur – any other operative or applicatory interferences are merely makeshift – though they may be all that the circumstances of the particular case leave available.

Palliative procedures are only warrantable where radical measures are impossible or refused, and where some degree of temporary relief is desired or control of hemorrhage is required.

The radical removal of the uterus by the vaginal route is described in Chap. LXXXIX (v. Index).

The radical removal of the uterus by the abdominal route is given in Chap. XCII (v. Index).

Several of the most frequently resorted to palliative measures will be here briefly mentioned.

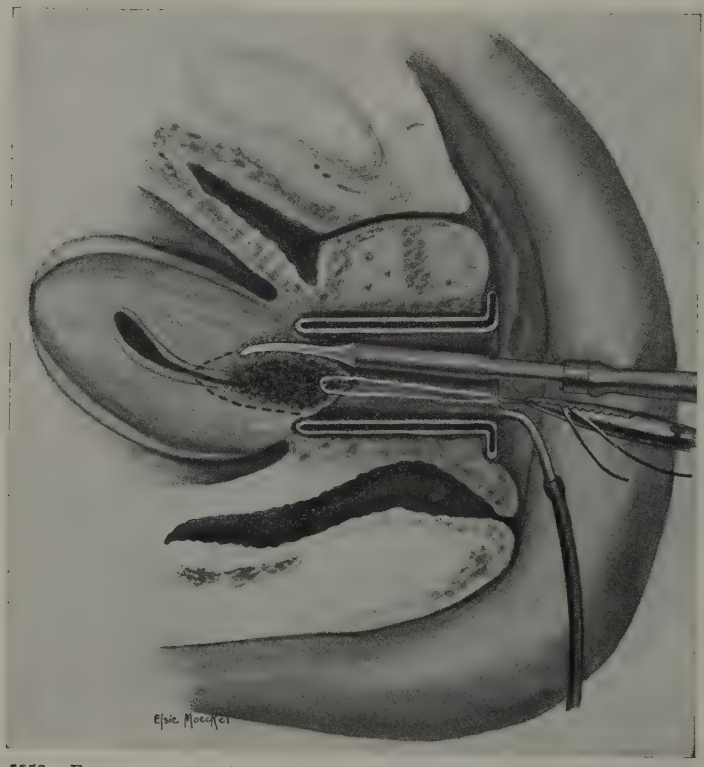


Fig. 5550.—Excision of the Cancerous Cervix by Galvanocautery – Byrne's Method.

Excision of the Cancerous Cervix by Galvanocautery – Byrne's Method.—In this procedure, which was practised with considerable success by its originator, the focus of disease is bodily excised, while the relatively non-resistant cancer cells which may have been left in the immediately outlying areas are destroyed, and the off-going lymphatic tracts sealed by heat coagulation.

The general method of procedure is to insert a water-cooling type of vaginal speculum (to protect the adjacent parts from overheating) – after which the lips of the diseased cervix are sutured together, leaving the ends of the sutures long, as tractors, or they are seized by tenaculum forceps and drawn forward. The cautery point is brought to sufficient temperature for thermo-

coagulation outside of the immediate tract, without active destruction _ while just hot enough to cut its way through the immediate course of transit around the growth. The curved point of the cautery is so directed that it cores out a conical piece of cervical tissue _ in the manner shown in Fig. 5550. Great care, as well as judgment, is required in so directing the course of the cautery point and blade that the limits of the uterus are not traversed and adjacent structures, including the peritoneum, invaded. No one has, subsequently, achieved the success that Byrne did in applying this technic. The following procedure is an outgrowth of the Byrne method.

Destruction of Cervical Cancer by Low-heated Galvanocautery, Passed Through the Cervix and Regulated by a Hand Within the Abdomen _ Percy's Method.—The principle here applied is the more prolonged application of a lower degree of heat by means of an electrode carried through the uterine cervix, while a hand introduced into the abdomen surrounds the uterus, determining the degree of heat and safeguarding the surrounding structures. (This method, involving the abdominal cavity, more properly belongs in Chapter XCII, but is here considered for general convenience.)

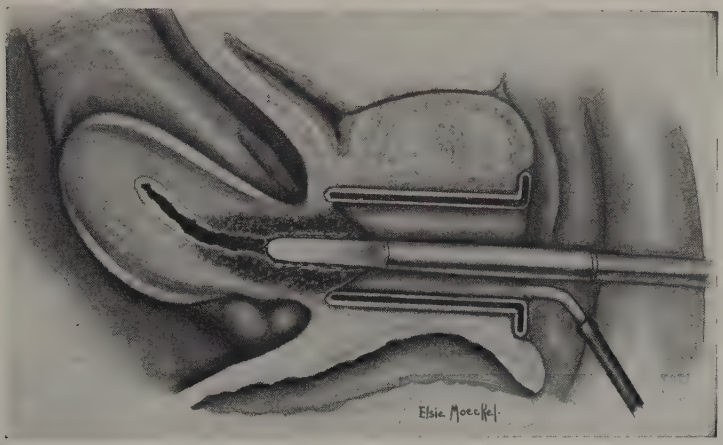


Fig. 5551.—Destruction of Cervical Cancer by Low-heated Galvanocautery, Passed Through the Cervix and Regulated by a Hand Within the Abdomen _ Percy's Method.

Percy writes _ "Experimental work has shown that a low degree of heat has a much greater penetrating power in a mass of cancer than has a high degree. High degrees of heat carbonize the tissues, inhibiting penetration; low degrees of heat coagulate the tissues, encouraging heat dissemination. High degrees of heat, with the resulting carbon core, prevent drainage in the cancer mass. This permits, in a certain number of cases, the absorption of an excessive quantity of broken-down cancer cells, which are dangerous to the life of the patient." The test made of the heated cautery point, at the temperature at which it is applied, is that cotton wrapped around the point and in contact for forty minutes or more is not even discolored. No cauterization or burning, therefore, occurs _ in contradistinction to the method just described.

The galvanocautery point is passed through the cervical canal and a temperature of 110° to 115° F. is maintained for from fifteen to twenty minutes _ while an Assistant's hand within the abdomen holds the cervical tissues pressed against the cautery, both for the better conduction of the heat through the tissues and for determining its degree, as transmitted to his own sense of heat, through a rubber glove. The application is made through a water-

cooled vaginal speculum. The technic is shown in Fig. 5551. The method of action claimed by its originator is that the growth is destroyed in the zone immediately next the electrode – thermocoagulation in the next zone – and that in the third zone the weakly resistant cancer cells are killed, while the more resistant tissue cells are unharmed.

Treatment of Cervical Cancer by Curetage and Cauterization.—The soft broken-down and breaking-down tissue is removed with a sharp curet – down to firm normal or more normal tissue. Considerable bleeding may occur while going through the diseased tissue, but usually considerably decreases as the firmer tissue is approached. The parts are then dried and some form of cauterant application at once made – the actual cautery, carbolic acid, acetone, chlorid of zinc, and the like.

In cureting the diseased tissue the greatest care must be exercised that the entire uterus be not penetrated, and adjacent organs damaged both by the instrumentation and by the spread of the disease. It is important that the Operator bear in mind that all such technics as opening up cancer sites by curetage, or other method of wounding, are directly contributory to the lymphatic dissemination of cancer cells – unless all efferent and distributing channels and routes be immediately sealed off by some method of cauterization.

All parts not directly involved in the technic should be protected during and following the instrumentation and subsequent applications.

Treatment of Cervical Cancer by Vascular Starvation – Kroenig.—Through an abdominal section, which is often begun as an exploratory measure, the hypogastric, ovarian, and round ligament arteries are tied.

When "lymph-blockage" is combined with this technic the lymphatic glands and vessels between the receptaculum chyli and the two obturator foramina are removed.

Retardation of progress in the growth and of hemorrhage from it are the usual results of this procedure, or combination of procedures.

Removal of the uterine adnexa is sometimes associated with the above technics.

Application of Radium Emanations – and of Roentgen-rays – to Cervical Cancer.—Have both been helpfully used – especially the former – but do not come within the scope of Operative Technic.

AMPUTATIONS OF THE CERVIX UTERI, IN GENERAL

An attempt is sometimes made to classify the amputations about the cervix into, first, Infravaginal Amputations, or amputation of the vaginal cervix, or partial amputation – and, second, Supravaginal Amputations, or amputation of the entire cervix.

Among the Infravaginal Partial Amputations several main methods of operating intravaginally and without opening the peritoneum are in use – represented by the single-flap method of Schroeder (mainly indicated where the mucous aspect of the cervical canal is involved) – the double-flap method of Markwald (chiefly indicated where there is hypertrophy of the cervical tissues, between the outer cervicovaginal and inner intracervical mucosæ) – and transverse circular section of the cervix, with provision for mucosal flap-coverings (which is the type of operation now most frequently employed, and which is indicated where there is both general hypertrophy of the cervical tissues and disease of the mucosa and its glands).

Further, there are several variations of technic in the main type of the infravaginal partial amputations about to be considered.

It is of very little practical value to differentiate between amputations of part of the cervix (infravaginal amputations) and amputations of the whole cervix (supravaginal amputations) — the technic, in general character, being the same in both — but the former will be considered here — and the latter in Chapter LXXXVII, Intravaginal Operations Upon the Cervix, Body and Cavity of the Uterus.

INTRAVAGINAL PARTIAL AMPUTATION OF THE CERVIX UTERI

BY SCHROEDER'S SINGLE-FLAP METHOD

Description.—This procedure is especially applicable in lacerated and hypertrophied cervices with eroded and everted lips, and particularly where the cervical glands are markedly involved by cystic degeneration. The excess of the hypertrophied portion is excised, but the feature of the operation

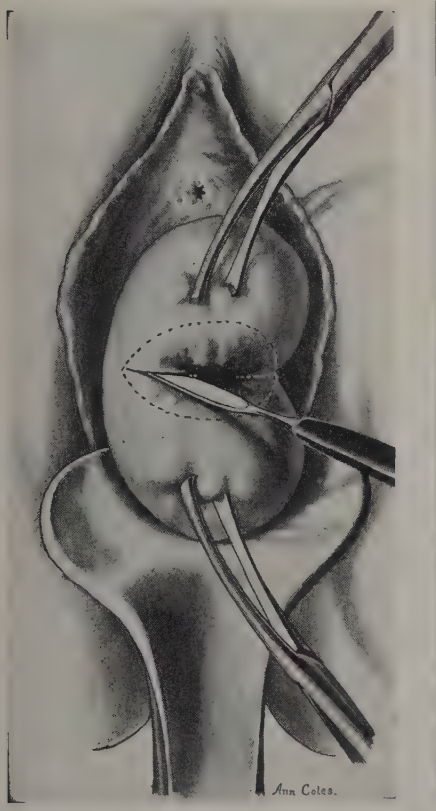


Fig. 5552.—Schroeder's Single-flap Operation for Partial Amputation of the Cervix Uteri — Tweedy's Technic — I: — Tenaculum forceps bringing forward the torn and hypertrophied lips of the cervix; — lateral, axial incision, splitting the cervix toward the lateral vaginal fornices; — transversely oblique, tongue-shaped incision, passing over each cervical lip, and meeting the axial incision near its ends. (Figs. 5552–5555 modified from Tweedy, in Eden and Lockyer's work.)

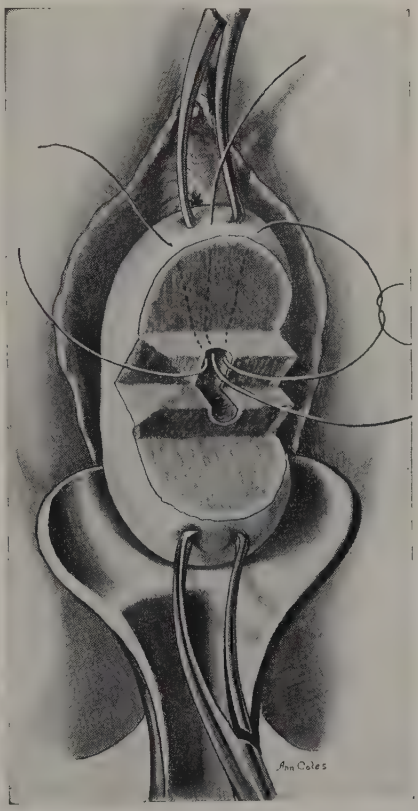


Fig. 5553.—The Same — II; — The cervix has been split and the two wedge-shaped or cubical pieces of cervical tissue excised. One of the secondary lateral triangular excisions of tissue is shown for securing better coaptation. The sutures are in position for the primary approximation of the cervical flaps to the margins of the cervical canal and to the "steps."

is that the partial amputation of the cervical lips is so made at the expense of their intracervical mucous aspect, rather than of their vaginal aspect, thus getting rid of the diseased glands. In contradistinction to this principle there are operations which chiefly aim to remove the element of hypertrophy without special reference to the glandular aspect of the case – while there are still others in which both the hypertrophied and glandular elements are included in the partial amputation. The Schroeder technic is sometimes spoken of as the "one-flap amputation method" – in contradistinction to the Simon-Markwald "two-flap amputation method." In the former the glandular and

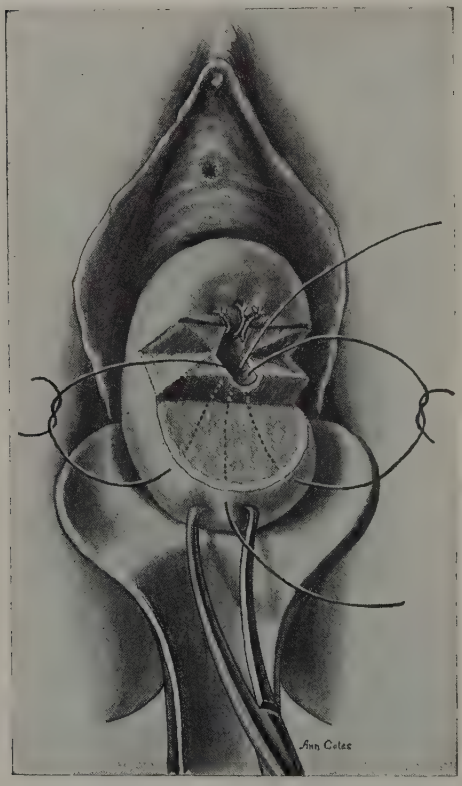


Fig. 5554.—The Same – III; – The primary sutures of the upper flap have been tied, approximating the upper flap to the "bench" – and those of the lower flap are being tied. Some of the secondary sutures, approximating the "benches," are placed.

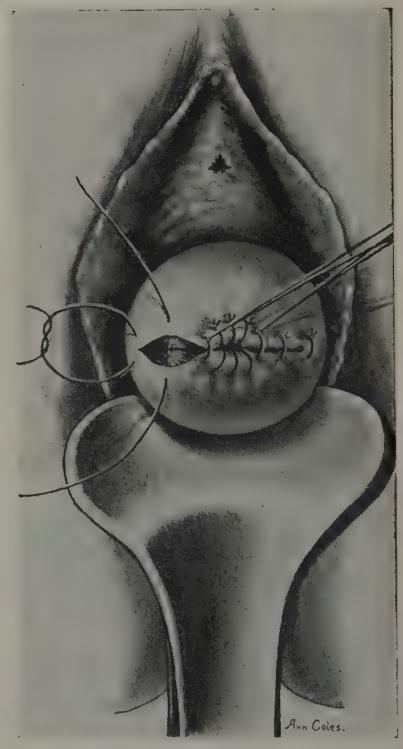


Fig. 5555.—The Same – IV; – The secondary sutures are being tied – approximating the two "benches" and the margins of the wound – leaving the cervical canal patulous.

subglandular part of each cervical lip is excised, after which what is left of each lip is folded upon itself, and the mucosa of its vaginal aspect sutured to the mucosa of the cervical canal, just above the line of amputation. The single- and double-flap features of these two operations can only be appreciated in sectional view.

Operation.—The technic is somewhat difficult to describe and illustrate. The chief part of the problem is to provide flap-covering which will be fully coaptable, without tension. Two somewhat different methods of procedure will be described.

Schroeder's Partial Amputation of the Cervix Uteri, According to

Tweedy's Technic.—In this method a thicker flap-covering is provided. With the patient in the dorsal posture, a weighted posterior speculum in position, the anterior and posterior cervical lips are seized with bullet forceps—grasping the cervix parallel with the laceration and outside of the area of erosion. While the two lips are thus drawn forward and held apart, the cervix is split in its midlateral axis, from the upper limit of the laceration, extending thence into the lateral fornices as far as may seem necessary (Fig. 5552). A deep, transverse, tongue-shaped incision is now carried across the vaginal aspect of the anterior cervical lip, on a level with the highest extent of the laceration—and extending at either end quite to the level of the original incision splitting the cervix, but meeting this splitting incision a short distance from its ends. When this tongue-shaped incision meets the original cervix-splitting incision, a wedge-shaped, or more or less cubical piece of cervical tissue drops away. When these steps are repeated upon the lower cervical lip the appearance of the parts is as shown in Fig. 5553. The object in so directing and ending the second, or tongue-shaped incision, so that a "stepped" outline is given to the remaining parts, is to make provision for the better coaptation of those parts by suture—and also for a greater length of cervical mucosa. To enable the two primary cervical flaps to meet in easy approximation, without too great strain upon the stitches, an additional smaller wedge of tissue may be cut from each outer lateral aspect, as shown in the last illustration. Three chromic catgut sutures are now carried through the vaginal mucosa and the corresponding cervical mucosa of the corresponding lip of the split cervix. To prevent tearing out these stitches should take good hold at some distance from the margins, especially of the cervical mucosa and the contiguous bench, or step of tissue. The rest of the terminal margins of the split lips are, likewise, sutured to the prominent margins of the steps, or shelves, of tissue. These stitches are shown in Fig. 5554. When this primary suturing is

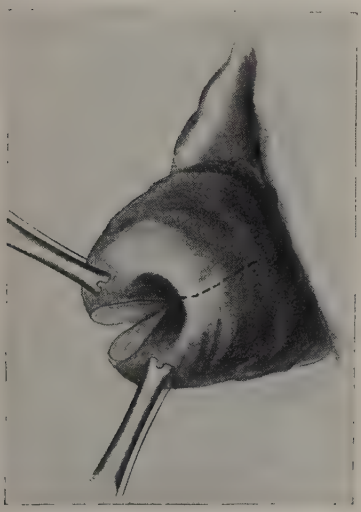


Fig. 5556.—Schroeder's Partial Amputation of the Cervix Uteri, According to Hartmann's Technic—Providing Flap-covering of Intermediate Thickness—I;—Splitting the cervix laterally into anterior and posterior halves.

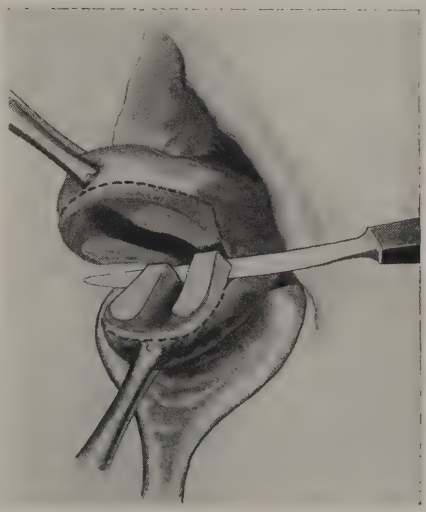


Fig. 5557.—The Same—II;—Amputating (excising) part of the cervical lips and the cervical canal.

finished one is then better able to excise the two small secondary lateral triangles, or wedges, of cervical tissue, already referred to (especially including any scar tissue) which may make the final coming together of the parts, particularly the lateral aspects of the wound, more satisfactory. From this stage onward the parts are sutured very much as in an ordinary trachelorrhaphy. Two deeply placed lateral chromic catgut stitches are first carried just above the highest extension of the lateral cuts — and these sutures will control any tendency to hemorrhage from the cervical vessels. The finally sutured cervix presents the appearance seen in Fig. 5555.

Schroeder's Partial Amputation of the Cervix, According to Hartmann's Technic.—In this method a somewhat or considerably thinner flap-covering (as compared with the procedure just described) is provided. The flap is here cut at the expense of the intracervical mucosa and tissue — as in the above method, but is thinner — and may contain little more than the vaginal mucosa of the cervix. All of the intracervical mucosa and most of the cervical tissue are excised. In using this thinner flap no tension is placed

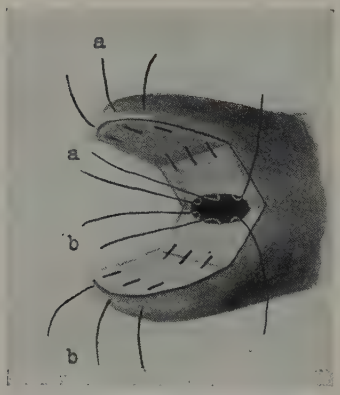


Fig. 5558.—The Same — III; — Placing the sutures to approximate the margins of the vaginal and intracervical mucosa.

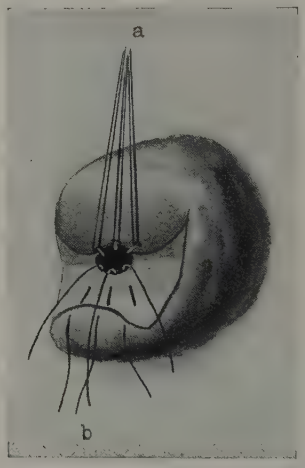


Fig. 5559.—The Same — IV; — Suturing the mucosal flap over the sectioned cervix — approximating the vaginal and intracervical mucosæ.

upon the sutures. It is a matter of individual judgment in the special case as to how much of the cervical tissues should be excised.

The cervix is drawn down — cureted — and then bisected in the midlateral axis (Fig. 5556). If an intermediate thickness of flap-covering be desired, a narrow bistoury may be inserted at the upper limit of the bisected cervix and a beveled section made in the manner shown in Fig. 5557 — removing the amount of cervical tissue, including the cervical canal, which may be considered necessary. The maneuver is repeated upon each lip. The intermediate amount of tissue here removed is seen in the illustration. Sutures are then placed, as shown in Fig. 5558, to unite the margins of the vaginal and intracervical mucosa.

If a flap-covering of little more than the cervical mucosa is desired — then, beginning at the free border of each bisected lip, or, if the orifice of the cervical canal be diseased, immediately to the outer side of the disease an incision is carried through the mucosa — which is dissected from that lip backward to its base — where the underlying muscular tissue of the cervix is trans-

versely divided, constituting a mucosal flap. This flap of mucosa is then dropped over the transversely divided portion of the lip _ and its margin sutured to the margin of the intracervical mucosa (Fig. 5559). The same steps are carried out in connection with the opposite lip. At the completion of this suturing a triangular or diamond-shaped gap will be left at each upper lateral

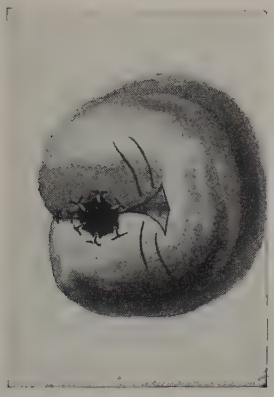


Fig. 5560.—The Same _ V; _ Completing the suturing of the mucosal flap over the stump of the amputated cervix _ closing the lateral angles of the wound.

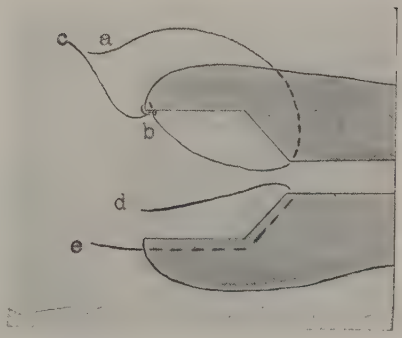


Fig. 5561.—Variations in the Method of Approximating a Moderately Thick Flap Covering to the Sectioned Cervix _ I: _ e, d, Suture buried between the points of entrance and exit; _ cba, suture, knotted at b, to enable tip of flap to be drawn downward and held there while tying the ends.

aspect of the wound, the margins of which must be brought together by separate sutures _ trimming the tissues somewhat, if required in order to secure better approximation (Fig. 5560).

In suturing the margins of the flaps of intermediate thickness some difficulty may be experienced in the nicety of adjustment, and in the holding of the sutured parts into such accurate contact that hematomata will not be likely

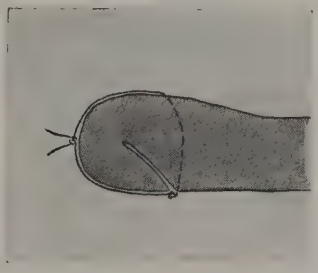


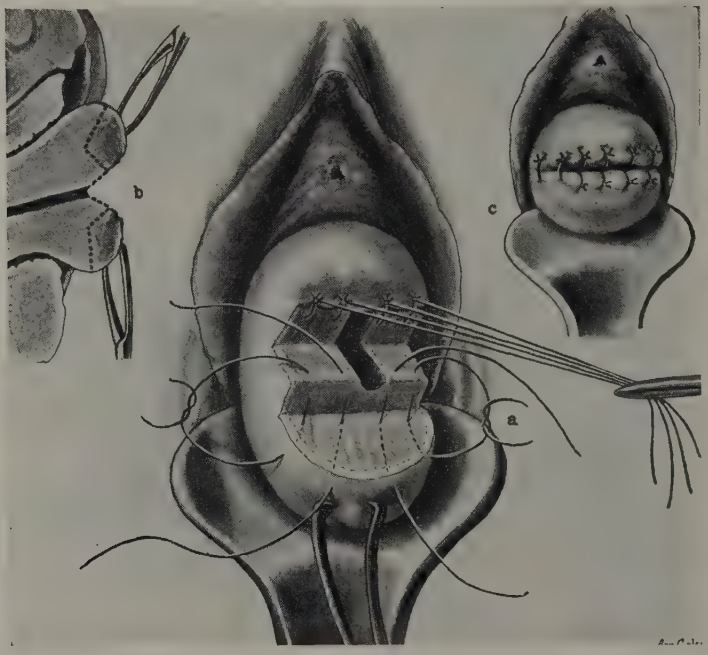
Fig. 5562.—The Same _ II; _ Sectional view of suture cba, in Fig. 5561, shown tied.

to occur. The lips may be brought against the cervical bed by sutures placed as already shown _ or by sutures everywhere buried, except at their entrance and exit (Fig. 5561, **e, d**) _ or, in order to hold the flap against the base while tying, the suture may be carried through the terminal margin of the flap and knotted (Fig. 5561, **b**), after which the end, **a,** may be carried through the base of the cervical denudation, brought around, and tied to **c** (Fig. 5562).

INTRAVAGINAL PARTIAL AMPUTATION OF THE CERVIX UTERI

BY MARKWALD'S DOUBLE-FLAP METHOD

Description.—This method of procedure is particularly applicable to abnormal cervices, whether from disease, laceration, or congenital cause, in which the element of hypertrophy is marked – rather than where the predominant element is disease of the mucosa (in which latter, the Schroeder operation, just described, is the preferable operation of the two). The essential feature of the present technic is the excision of a wedge-shaped portion of the cervical tissue from the face of the cervix, the apex of the wedge being above – leaving, for approximation, an outer flap covered with vaginal mucosa, and an inner flap covered with intracervical mucosa. These outer and inner flaps



Figs. 5563–5565.—Markwald's Partial Amputation of the Cervix Uteri by Excision of Cervical Tissue: – a, The cervix has been split and a cuneiform piece of cervical tissue has been excised from the upper lip and from the lower lip. The placing of the sutures and the tying of them, to approximate the double "steps" of the upper and lower cervical aspects, is seen. b, The indicated areas of cervical tissue to be excised. c, The sutured cervix.

may be formed without transversely excising any portion of the cervix – but are generally formed after some portion of the hypertrophied cervix has been transversely amputated.

Operation.—Two forms of the Markwald double-flap operation will be here described – the first really a tissue excision (excavation of cervical tissue) without amputation – and the second, combined excision and amputation of the cervix.

Markwald's Partial Amputation of the Cervix Uteri by Simple Excision of Cervical Tissue, Without Transverse Circular Division.—In this technic the redundant cervical tissue is excised through the free face of the split lips in wedge-shaped fashion, without transverse circular division of the cervix above its free face. The amount and position of the cervical

tissue removed is shown in Fig. 5564, **b.** The cervical lips are seized with tenaculum forceps, drawn forward, and laterally divided by scissors – the lateral cuts extending as far toward the lateral vaginal fornices as may be indicated by the amount of cervical tissue to be removed. A cuneiform segment of tissue, with its apex toward the uterus and its base corresponding with the terminal face of the split lip, is excised from the upper and lower lips – thus leaving two flaps with raw surfaces facing and the inner aspect of the inner flaps covered by intracervical mucosa, and the outer surfaces of the outer flaps by

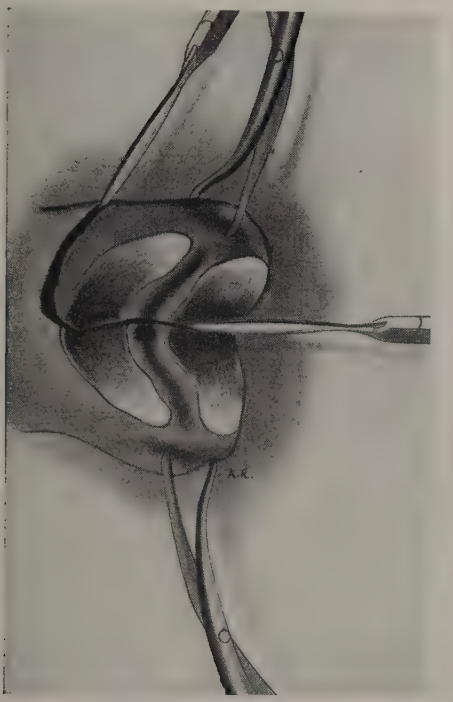


Fig. 5566.—Markwald's Partial Amputation of the Cervix Uteri by Combined Transverse Section and Excision – I; – The cervix has been laterally split – after which each half-lip is excised in wedge-shaped fashion by two oblique incisions which meet in the cervical tissues – one, entering the vaginal aspect of the upper lip and passing obliquely upward and inward, and the other, entering the intracervical aspect of the upper lip and passing obliquely upward and outward, to meet the first incision. Corresponding incisions accomplish the wedge-shaped removal of the lower half-lip.

Fig. 5567.—The Same – II; – Placing the sutures – **a, b,** through the inner and outer margins of each half-lip – **c,** silkworm suture (all the rest are forty-day chromic catgut) through the outer lips and prominent intermediate ridge of cervical tissue – **d, e,** through the outer lips of the lateral aspects.

vaginal mucosa (Fig. 5563, **a**). The opposite margins of the lips are brought together by chromic catgut sutures – suturing first the two lips of the two flaps first made before making the remaining two flaps, if there be much tendency to bleed – or stuffing the cavity made by the first set of flaps with gauze, while the second set is being made. The completely sutured wound is shown in Fig. 5565, **c.**

Markwald's Partial Amputation of the Cervix Uteri by Combined Transverse Section and Excision.—The cervix, drawn down and steadied

by tenaculum forceps, is split with scissors or knife, laterally (Fig. 5566) – the lateral cuts extending as far toward the vaginal fornices as may be re-

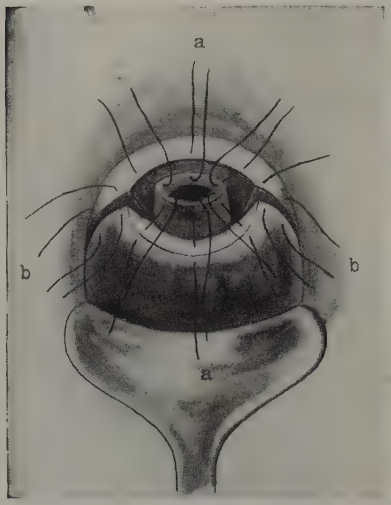


Fig. 5568.—Markwald's Partial Amputation of the Cervix Uteri by Simple Excision of Cervical Tissue, Without Transverse Division; – The excised cervical tissue and the position of the sutures.

Fig. 5569.—The Same; – The sutured wound.

quired, but not higher up than 1.2 cm. ($\frac{1}{2}$ inch) of the internal os. The free portion of each half-lip is then removed by two obliquely directed incisions,

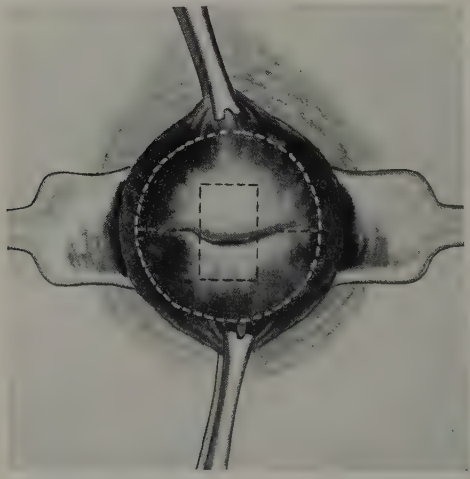


Fig. 5570.—Partial Amputation of the Cervix Uteri by Combined Denudation and Excavation – McKay – I; – The areas between the dotted lines are to be denuded.

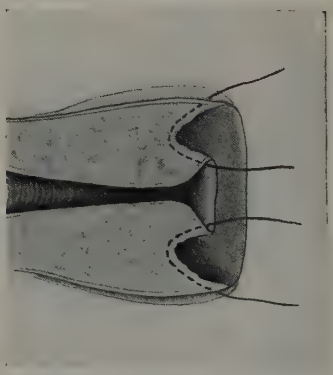


Fig. 5571.—The Same – II; – Sectional view of the denuded and excavated cervix, with the position of the median sutures shown.

which, by their meeting, produce a cuneiform effect – leaving a trough-like hollow upon the retained portion of the uterus (Fig. 5567). The parts are

then brought together with forty-day chromic catgut sutures, reinforced wherever may be necessary by silkworm sutures _ two of which it is at least well to use. These sutures approximate first the inner to the outer lips (Fig. 5568). After the width of the cervical canal is passed, the sutures unite the opposite margins of the outer lips _ and then the lateral aspects of the wound. When the suturing is completed the appearance is as shown in Fig. 5569.

Partial Amputation of the Cervix Uteri by Combined Denudation and Excavation _ McKay.—This procedure may be regarded as a measure intermediate between the Emmet type of trachelorrhaphy and the Markwald double-flap amputation _ or as a modification of the latter. It is applied by McKay to those cases in which there is combined laceration and pouting of the cervical mucosa, or in cervical hyperplasia alone _ and is performed by him as follows: _ The cervix, during the days preceding operation, is depleted by local lancing and by glycerin-ichythol plugs. At the operation the upper

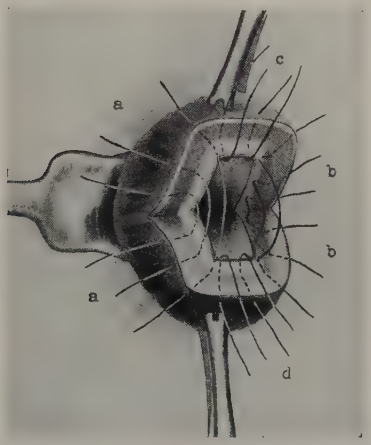


Fig. 5572.—The Same _ III; _ The placing of the sutures after denudation and excavation: _ **c** and **d**, Those uniting the margins of the median aspect of the intracervical and cervicovaginal mucosa; _ **a** and **b**, sutures uniting the lateral aspects of the wound.

and lower cervical lips are seized by tenaculum forceps, placed in the median line just beyond the limits of denudation. His brief description of the technic is here given: _ "The denudations (Fig. 5570) in this operation are made in a similar manner to those described under the Emmet operation, though usually we make the first lateral incision somewhat deeper, so that the lips will gape more. The operations *differ* from the Emmet in this respect _ that the median ribbon of tissue that is left untouched in the Emmet is here divided, and the upper portion on the upper lip and the lower portion on the lower lip is removed (Fig. 5571). The reason for this is that by this means we are enabled to make a concave excavation of the greater part of the hypertrophied tissue in both lips. The sutures (Fig. 5572) are introduced in the same fashion as the sutures in Emmet's operation, and, in addition, two sutures are passed so as to bring the mucous membrane of the cervical canal up toward the external surface of the cervix. These sutures should never be omitted, otherwise very severe hemorrhage may occur."

INFRAVAGINAL PARTIAL AMPUTATION OF THE CERVIX UTERI

BY CIRCULAR SECTION

Description.—In the circular type of amputation of the cervix all of the elements below the line of section are removed _ not chiefly the mucous aspect of the cervix, as in the single-flap operation of Schroeder _ nor chiefly the intermediate hypertrophied tissues between the vaginal and intracervical mucosa, as in the double-flap operation of Markwald. It is, therefore, a more radical type of procedure than either of the others _ and, in one or another of its several forms _ simply as a circular amputation, or in conjunction with some provision of flap-covering _ may be said to represent the technic most frequently adopted in the infravaginal removal of the cervix uteri at the present day.

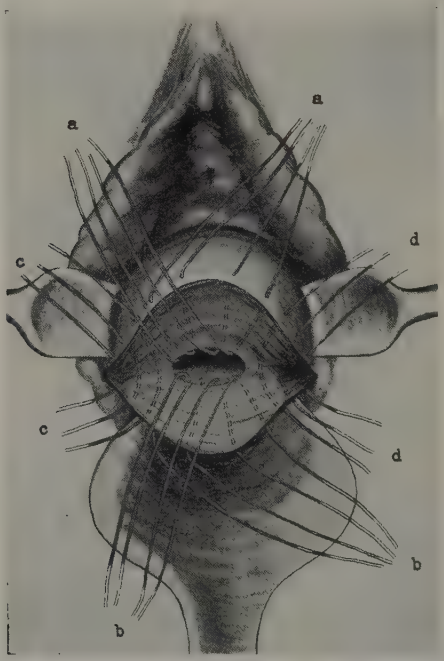


Fig. 5573.—Low Infravaginal Partial Amputation of the Cervix Uteri by Circular Section _ I; _ Suturing the wound: _ a, a and b, b, Uniting the margins of the intracervical and extracervical mucosa; _ c, c and d, d, uniting the lateral margins of the mucosa.

The more radical forms of cervical amputation are called for in the following conditions: _ cervical hypertrophy; chronic cervicitis, especially associated with laceration; uterine prolapse; eversion of the cervical lips; elongation of the cervical lips; benign tumors; malignancy of the cervix, where, for some reason, removal of the uterus is contraindicated.

A low and a high form of infravaginal circular amputation will be described. Supravaginal amputation of the cervix will be described in Chapter LXXXIX (q. v.).

Low Infravaginal Partial Amputation of the Cervix Uteri by Circular Section.—The patient is placed in the lithotomy position. The cervix is usually dilated _ and the uterocervical canal cureted. The lips of the cervix are seized with tenaculum forceps and drawn outward _ and, while thus held,

a knife is swept circularly around the cervix, at the predetermined level, depressing the cervix in making the anterior section, and elevating it while making the posterior section. Before the section is completed the cervix is caught with a clamp to hold it under control during the rest of the manipulation. In relatively small cervices of pliable tissue no special provision may have to be made in this simple form of amputation, for the union of the margins of the vaginal and intracervical mucosa. In instances, however, where the cervical walls are hypertrophied and indurated, as by the products of chronic cervicitis, it may be necessary to excise a wedge-shaped piece of cervical tissue from the site of the anterior and posterior lips, so as to enable the parts to be more readily brought together. The approximation of the vaginal and intracervical mucosæ may be also aided by limited mobilization of the mucosa. The sutures are so placed to bring together the mucosa of the cervical canal

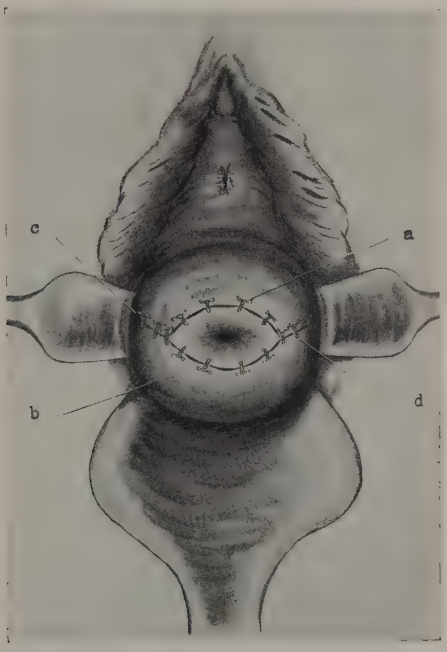


Fig. 5574.—The Same _ II; _ The sutured wound.

to the anterior and posterior vaginal mucosa _ and the lateral margins of the vaginal mucosa into contact with each other (Fig. 5573). These stitches, when tied, give the appearance as shown in Fig. 5574.

High Infravaginal Partial Amputation of the Cervix Uteri by Circular Section _ Doederlein.—This method is especially applicable to hypertrophied and elongated cervices. The cervical canal is usually dilated and the uterocervical canal cureted and swabbed with the tincture of iodin. While the lips of the cervix are drawn downward by tenaculum forceps (the vagina being distended by a posterior self-retaining speculum), a circular section, by knife, is made around the cervix at some intermediate level between the os and the upper part of the cervix, dependent upon the conditions in the individual case _ but at such a level as to make provision for the final circular section of the muscular portion of the cervix not nearer than 1.2 cm. ($\frac{1}{2}$ inch) below the internal os. All lacerated scar tissue should be included in the

removal. The minimum length of cervix should be sacrificed that will subserve the needs of the case _ especially where pregnancy is likely to occur, and where such a uterus might be made incapable of holding a fetus. The cervicovaginal mucosa is pushed upward from all around the cervix by blunt dissector, finger, or handle of the scalpel (Fig. 5575).

When the cervix has been sufficiently freed up to and a little beyond the line of circular section, it is split bilaterally by scissors (Fig. 5576, **c**) _ while the parts are under moderate tension. The two halves of the cervix are now to be divided at their upper aspect _ which may be accomplished in one of several ways, in accordance with what may be required to secure parts which can be subsequently covered by mucosa, after being brought together. In small, soft cervices the lips may simply be transversely divided at their upper ends

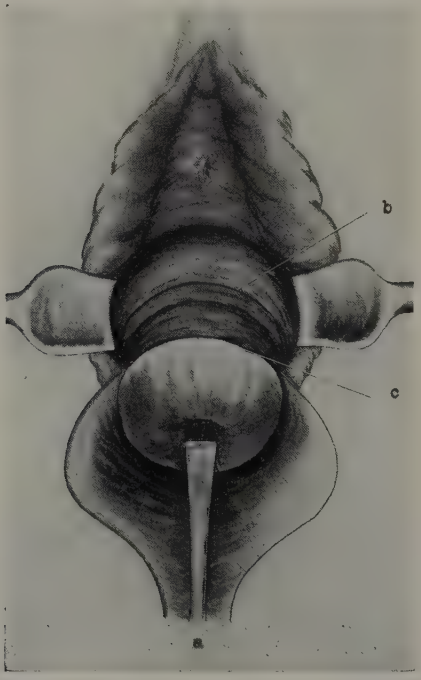


Fig. 5575.—High Infravaginal Partial Amputation of the Cervix Uteri by Circular Section _ Doederlein _ I: _ **a**, Tenaculum forceps, drawing the cervix downward; _ **c**, line of circular section of the cervical mucosa; _ **b**, the divided cervical mucosa, freed backward by blunt dissection.

(v. Fig. 5576, **d**). If they be thick and infiltrated, the division of their muscular substance may be made in cuneiform manner. Or, after dividing the cervix transversely, it be found that the parts do not come well together, than a trough-like groove, or V-shaped excision of tissue may be made upon their faces _ which will have the effect of having performed a cuneiform amputation. All vessels which are now found bleeding are tied with fine chromic catgut. The intracervical and extracervical mucosal margins are then brought together over the raw cervical face _ by thirty- or forty-day, No. 2 chromic catgut, the stitches taking a deep hold of the intervening muscular tissue of the cervix _ in the manner shown in Fig. 5577.

Higher Intravaginal Partial Amputation of the Cervix Uteri by Circular Section _ Where it is Necessary to Free the Downwardly Dis-

Fig. 5576.—The Same – II; – The cervix has been first split, bilaterally, by scissors manipulated as shown at c; – after which the split lips are transversely divided by scissors, as shown at d. (These two stages of the technic are shown in one picture for convenience.)

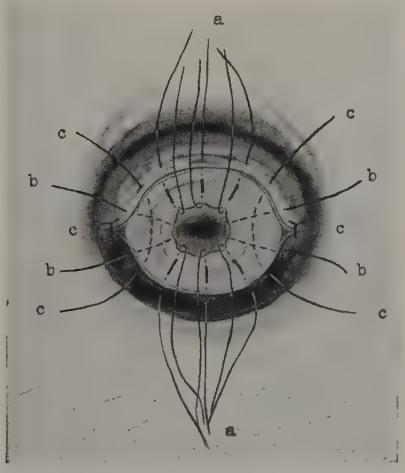


Fig. 5577.—The Same – III; – Suturing the wound: – a, a, Approximating the margins of the vaginal and intracervical mucosa; – c, c, sutures approximating the lateral aspects of the cervical wound

placed Bladder – McKay.—In those cases where the bladder has been drawn downward by the abnormal cervix, it may be necessary to separate the bladder from the anterior aspect of the cervix. After defining the lower limit of the

bladder by means of a sound passed within it and carried downward toward the vagina, a limited transverse incision is made in the anterior fornix with scissors, into the connective-tissue plane – after which the bladder is freed upward from the cervix by blunt dissection. While the freed bladder is held upward, out of the way, two sharp steel skewers are carried through the midvertical and lateral axes of the cervix (Fig. 5578) – and, above these, a rubber catheter is tied. The cervix is then split bilaterally – divided below the skewers – and the face of the transversely divided cervix excavated in cuneiform fashion. Any vessels detected in the wound (which must be seen, rather than found by

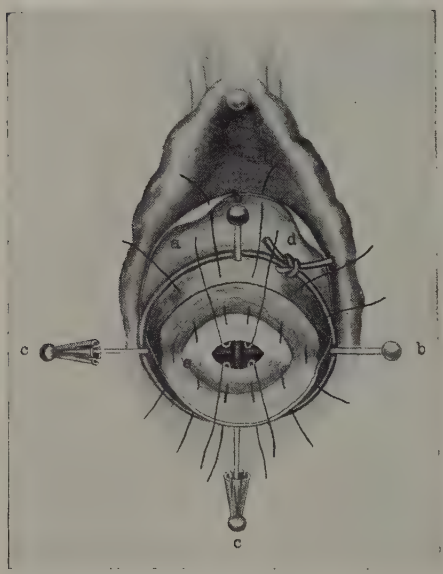


Fig. 5578.—High Intravaginal Partial Amputation of the Cervix Uteri by Circular Section – Where it is Necessary to First Free the Downwardly Displaced Bladder – McKay: – The transversely divided mucosa, over the anterior aspect of the upper part of the cervix, has been freed upward by blunt dissection in the connective-tissue plane, carrying the bladder upward with it, **a**; – two steel skewers have been passed through the cervix, at right angles and capped, **bc, bc**; – a rubber tube, **d**, is carried around the cervix, above the skewers, over the mucosa of the lower aspect, but under the mucosa of the upper aspect. (Figs. 5578 and 5579 redrawn from McKay.)

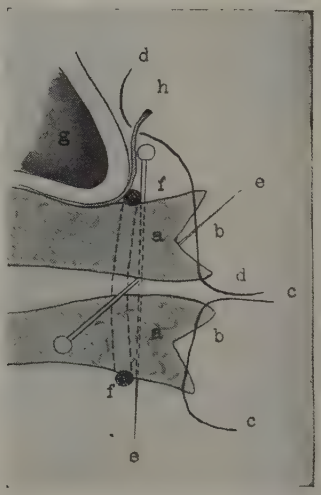


Fig. 5579.—The Same, in section: – **g**, The freed and upwardly displaced bladder; – **h**, the mucosa of the upper cervical lip, freed along with the bladder; – **e, e**, skewers, at right angles; – **f, f**, rubber catheter; – **a, a**, cervical lips; – **b, b**, excavations made in cervical lips, for the better closure of the wound; – **c, c**, suture of the lower lips, both ends passing through mucosa; – **d, d**, suture of the upper lips, the lower end passing through mucosa, and, in the McKay technic, the upper end not, – but the upper end is here shown carried through the margin of the mucosa freed upward, along with the bladder.

their bleeding, as the tourniquet is still in position) are caught and tied with fine chromic catgut. In the McKay technic the sutures are placed while the skewers are still in place – which, while enabling the vaginal and intracervical mucosal margins of the lower lip to be included, prevent the inclusion of the corresponding margins of the upper cervical lip – so that they include the intracervical mucosal margin, but not the vaginal mucosal margin of the upper lip. The upper margin of mucosa is simply allowed to fall over the otherwise sutured wound and forms adhesions. (It would seem, however, that the sutures might be placed as McKay directs, and then, when the skewers are removed, before the sutures are tied, the upper sutures could be readily carried

through the upper mucosal margin with a Reverdin needle. This carrying of the suture through the upper mucosal margin is seen in Fig. 5579 at **d** and **h** – the picture otherwise representing the McKay technic.)

OTHER FORMS OF INTRAVAGINAL AMPUTATION OF THE CERVIX UTERI

A number of variations in technic in infravaginal amputation of the cervix uteri is practised – several of which, apart from those already described, will be briefly mentioned.

Infravaginal Partial Amputation of the Cervix Uteri by Combined Flaps and Circular Section.—This method partakes, in a general way, of

Fig. 5580.—Infravaginal Amputation of the Cervix Uteri by Combined Circular Section and Flap Covering; – Outlining the flaps, preparatorily to turning them upward and transversely dividing the cervix *en masse*.

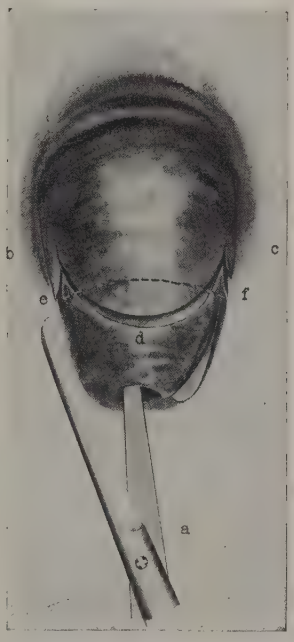
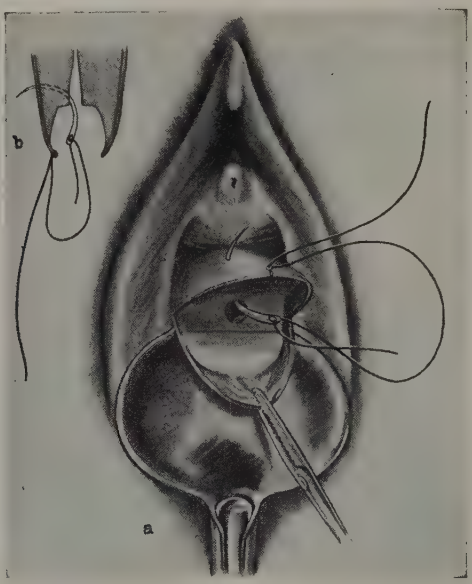
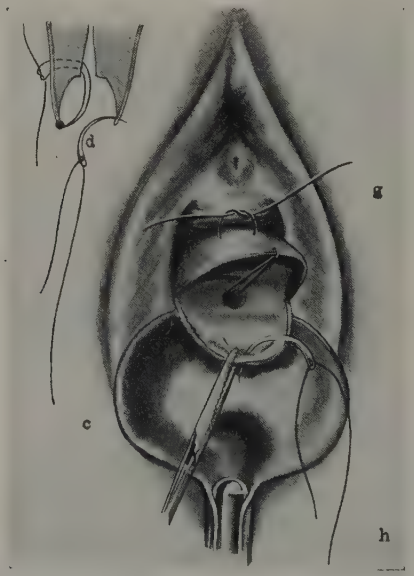


Fig. 5581.—Infravaginal Amputation of the Cervix Uteri by Combined Circular Section and Flap Covering: – **bdc**, Outline of the anterior and posterior flaps; – **a**, bilateral division of the cervix up to the line of dividing the cervix; – **ef**, line of transverse section of the cervix.

the features applicable to amputation of limbs by flaps and circular division. Having drawn the cervix downward with tenaculum forceps, and selecting the level at which the cervix is to be transversely divided, anterior and posterior flaps of cervicovaginal mucosa are outlined, planned of such length and contour as to provide ample covering for the raw face of the cervix (Fig. 5580). These mucosal flaps are freed backward by combined blunt and sharp dissection, until the desired level is reached – when the cervix is transversely divided. The center of the margin of each mucosal flap is then sutured to the corresponding margin of the intracervical mucosa, and the margins of the lateral aspects to each other – the details of which are shown in some of the preceding illustrations.



Figs. 5582 and 5583.—Bonney's Method of Suturing the Wound in Partial Amputation of the Cervix by the Flap Method _ I: _ a, The suture, tied in the midmargin of the anterior flap, is being carried into the cervical canal, and through the anterior cervical lip _ each limb of the double suture being separately placed (as shown in the succeeding picture); _ b, the technic seen in profile.

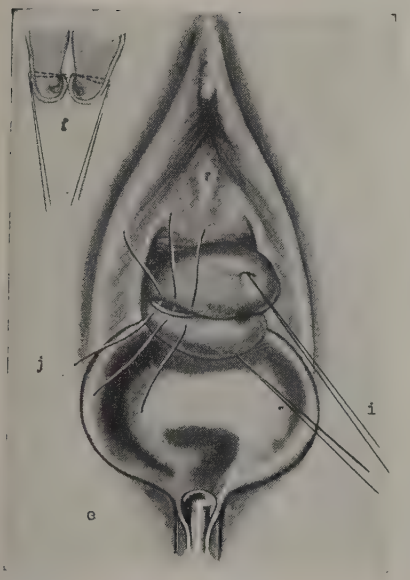


Figs. 5584 and 5585.—The Same _ II: _ c, _ g, Tying the suture of the upper lip; _ h, placing the suture in the midmargin of the mucosal flap of the posterior cervical lip; _ d, the technic seen in profile.

Instead of carrying out the procedure exactly as just described, the anterior and posterior flaps may be found and retracted _ then the cervix split

bilaterally – and each of the two half-lips transversely divided at their base – as suggested in Fig. 5581.

In the flap and circular section method of amputating the cervix, Bonney adopts a very clever method of suturing the flaps over the face of the stump and to each other. A long suture, threaded upon a curved needle, is passed through the margin of the apex of the anterior flap and tied – after which one limb of the suture is passed through the cervical canal and out through the cervical wall – as shown in Figs. 5582, **a** and 5583, **d**. This is drawn upon, until the mucosal flap is drawn over and held against the face of the cervical



Figs. 5586 and 5587.—The Same – III; – The sutures of the anterior and posterior cervical lips have been tied, and are being used as tractors, I; – the lateral sutures, **j**, are being placed. **f**, The technic seen is profile.

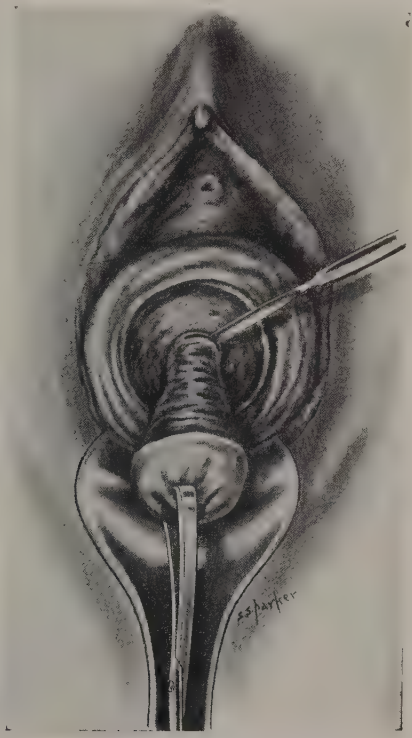


Fig. 5588.—Infravaginal Partial Amputation of the Cervix Uteri by Stripping Out the Core of the Cervix – Graves' Technic – I; – The cervix and tubal core are being freed by combined blunt and sharp dissection, nearly to the internal os. (Figs. 5588 and 5589 modified from Graves.)

stump – before doing which, however, the opposite end of the suture is similarly carried through the same course – but emerges at a slight distance from the first suture (Figs. 5584 and 5885) – after which they are tied together and henceforth used as tractors (Figs. 5886 and 5887). The margin of the apex of the posterior flap is now treated in the same manner. Provision for the new external os is thus made – and when this is accomplished and while the parts are held under tension by the suture tractors, the margins of the lateral aspects of the wound are sutured (Fig. 5886, **j**).

Intravaginal Partial Amputation of the Cervix Uteri by Stripping Out the Core of the Cervix – Hegar's Operation – Graves' Technic.—The

special field of application of this form of amputation is in the cases of thinned, elongated cervices, such as are often encountered in prolapsus. The position of the internal os is determined, preliminary, by the use of the sound _ but the cervix is not dilated, which would increase the tendency to tear it during the stripping. It is necessary to determine in advance, by sound, the position of the reflection of the bladder upon the anterior aspect of the cervix. The two lips of the cervix are seized by double-pronged tenaculum forceps to hold them closed during the manipulations in which the forceps serve as tractors _ and if there be lateral lacerations, it may be necessary to seize one or both of

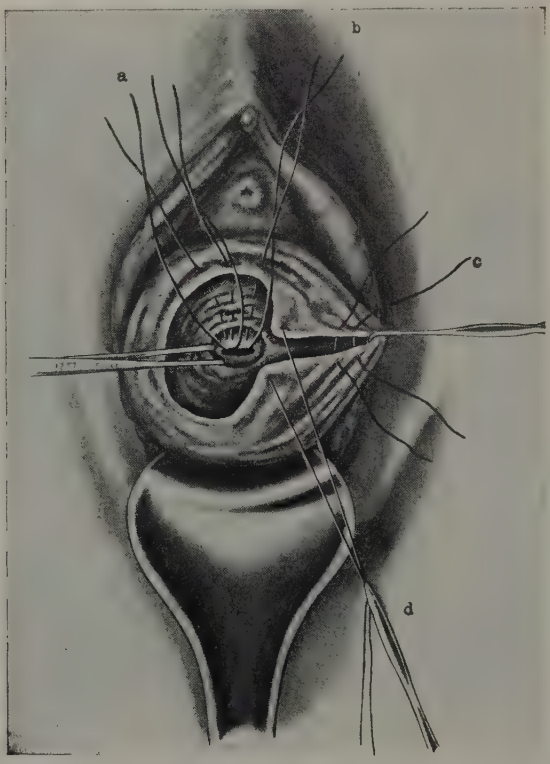


Fig. 5589.—The Same _ II; _ Suturing the wound: _ **ac** and **bf**, Stitches approximating the margins of the anterior and posterior intracervical and corresponding cervicovaginal mucosæ, being buried in the intervening cervical tissue at intervals; _ **d**, special sutures, approximating the cervicovaginal mucosa to the lateral ends of the cervical canal; _ **c**, the sutures of the margins of the lateral cervicovaginal mucosa of one side, being placed while the margins are held under tension between the special stitches just mentioned and a tenaculum.

these with an additional pair of tenaculum forceps. The terminal cervix thus controlled, the cervix is put upon moderate downward tension _ during which a circular incision is made with a knife just distal to the vesical reflection, that is, between it and the lower end of the cervix. This circular section passes through the mucosa, and the dissection is carried down, thence, to the tubular core of the cervical canal, being careful not to preliminarily cut the latter _ and exercising countertraction upon the cervix, while blunt dissection is carried on by means of two or three layers of gauze over the end of the right index, aided here and there by the point of the knife (Fig. 5588). Guarding the bladder is of primary importance _ as it is more apt to be injured than is

the danger of breaking into Douglas' pouch, whose attachment is higher, posteriorly, than is the bladder's attachment in front. The uterus is freed from the cervical canal upward to within a short distance of the internal os, as previously located. At this stage two small clamp forceps seize each lateral aspect of the cervical tube, immediately above the site at which it is to be divided. While the original clamps maintain tension, the cervical tubal core is divided, just below the second pair of small lateral clamps – but in such a wedge-shaped manner that the lips of the cervical canal left behind will present an outward convexity – which is an important feature of the operation, thereby affording intracervical mucosal margins to be sutured to the margins of vaginal mucosa. And it is also to be borne in mind that if the hold upon the proximal end of the cervical canal by the secondary clamps be prematurely relaxed, it may be hard to regain it for the purpose of suture. Any bleeding vessels encountered are tied with fine chromic catgut. The margins of intracervical and vaginal mucosa are brought together in the manner shown in Fig. 5589 – the stitches passing, at intervals, into the cervical tissue. A specially applied stitch is applied to approximate on each side the lateral aspects of the margins of the vaginal mucosa to the lateral limits of the margins of the intracervical mucosa – and the lateral margins of the cervicovaginal mucosa to each other. The last mentioned sutures are more easily applied if the parts be tensed as shown in the illustration. The operation just described constitutes a high amputation of the cervix.

CHAPTER LXXXVIII

OPERATIONS UPON FISTULÆ INVOLVING THE FEMALE GENERATIVE ORGANS

Operations upon fistulæ involving the female organs, in general, p. 316.
Operations upon fistulæ intercommunicating between the female generative organs and the ureters, p. 320.
Operations upon fistulæ intercommunicating between the female generative organs and the bladder, p. 325.
Operations for fistulæ intercommunicating between the female generative organs and the urethra, p. 355.
Operations for fistulæ intercommunicating between the female generative organs and the rectum, p. 358.
Enterovaginal fistulæ, in general, p. 367

OPERATIONS UPON FISTULÆ INVOLVING THE FEMALE GENERATIVE ORGANS, IN GENERAL

Apart from the large number of fundamental kinds of fistulæ of the female generative organs – intercommunicating between them and the ureters, bladder, urethra, and rectum – there are many and diversified combinations of these – and very many methods of operating upon both the simple and complex forms – the descriptions of some of which will follow:

Causes of Fistulæ of the Female Genital Tract.—Some idea of the variety and complications of fistulæ connected with the female genital tract may be judged from the large number of causative influences to which they may be due, such as – pressure during normal and unaided labor – traumatism to the adjacent parts, both in natural and instrumental labor – child-destroying operations – distended bladder during labor – calculi of the uretero-vesico-urethral tract – violent coitus – vaginal pessaries – foreign bodies introduced into the vagina, sometimes for purposes of masturbation – suppurations in the vicinity of the female organs – surgical injury in the removal of the uterus by either the abdominal or vaginal route – removal of pelvic tumors – radium applications – congenital conditions – and the like. It is worthy of note that the majority of fistulæ encountered, at the present day, are of surgical origin, and are due to the accidental wounding of the organs during difficult operations in obscured fields. The strictest asepsis should be observed during operation.

Preparatory Treatment for Operation.—In operating for fistulæ, it is especially desirable that the first effort should succeed – as the utilizable tissue is often largely cicatricial, and is made even less available by one or more unsuccessful attempts. The general health should be gotten into good condition. And the local parts should be free of all involvement other than the presence of the fistula – all inflammatory and infective conditions being brought under control. Especially should no operation be undertaken (unless imperatively necessary) during infection of either the genital or urinary tract. The condition of the urinary tract may be prophylactically aided by the preliminary use of urotropin. Frequent antiseptic vaginal douching should be carried out in advance.

Anesthesia – Analgesia.—Anesthesia is usually employed – especially in complicated cases. Spinal analgesia is sometimes used. In very minor cases nothing may be required, or simply cocain solution locally applied to the mu-

cosa. Novocain infiltration is sometimes employed – but an objection to all infiltration of the parts is that the resulting tumefaction will often materially interfere with the manipulations, not only in making the calculations for approximation and for flaps, but in the matter of suturing, for suturing of swollen structures may be water-tight at the time, and yield leakage when the infiltrated solution has been absorbed.

Position.—This will depend upon the position and nature of the fistula. The classical position is Sims' left genupectoral (Fig. 5590). The dorsoperineal is frequently used – and sometimes, the supported knee-chest.

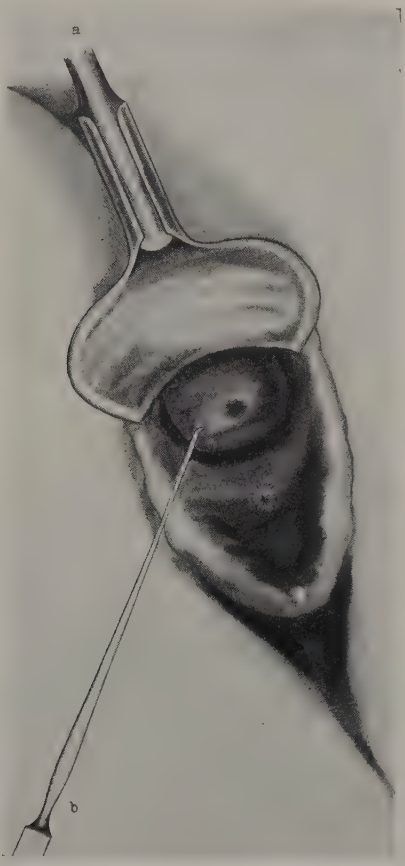
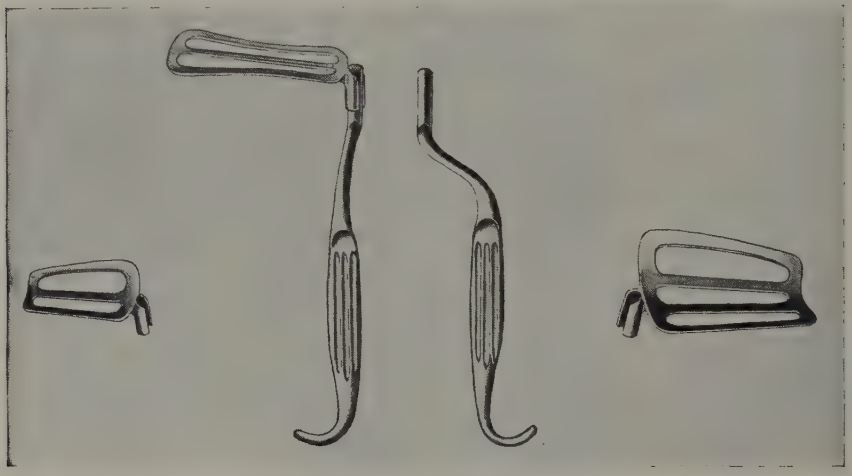


Fig. 5590.—The exposure of the parts in Sims' left genupectoral position – especially useful in operating upon the anterior vaginal wall and in the vaginal fornices.

Instruments.—It is particularly desirable to secure satisfactory exposure of the parts, which, sometimes at best, is difficult, It is well to have on hand a number of specula, manual and self-retaining (especially of the posterior, weighted type) and Sims', or its equivalent – and a variety of retractors. Some of these are shown in Figs. 5591 and 5596.

The special feature of the instruments employed should be sharpness of the cutting edges (to an unusual degree), so as not to haggle, serrate, or traumatize the raw edges and surfaces, the vitality of which are so essential to speedy and successful repair – and slenderness of handle, so as not to unneces-

sarily block the none-too-free view and working field – narrow straight, angular (Fig. 5597) and curved knives – straight and curved, small-bladed scissors – delicate tenaculum forceps and volsellæ – mosquito hemostats – fine plain and ribbed dissecting forceps – slender types of needle-holders – fine, curved needles – fine suturing material of very pliable silver wire, fine silkworm filament,



Figs. 5591 and 5592.—Simon's Vaginal Retractor.

fine chromic catgut, and silk – the majority of Surgeons probably preferring silkworm, or very fine and very pliable silver wire, capable of being tied, as is now made. When buried sutures are employed fine chromic catgut is used – but for direct approximation and tensile strength, most Surgeons consider that catgut softens and stretches too much, and is absorbed too soon. Silk

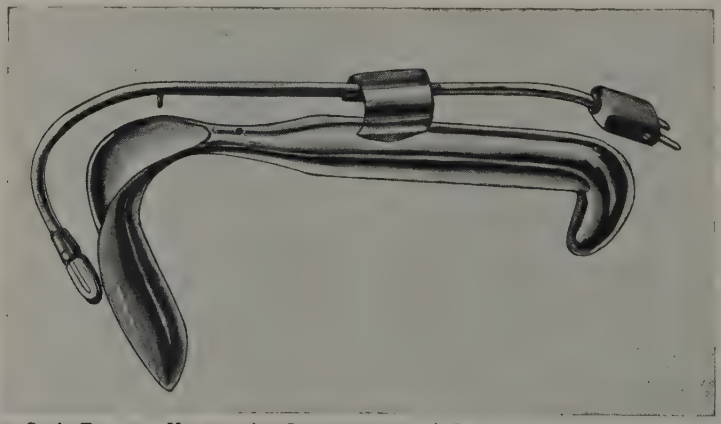
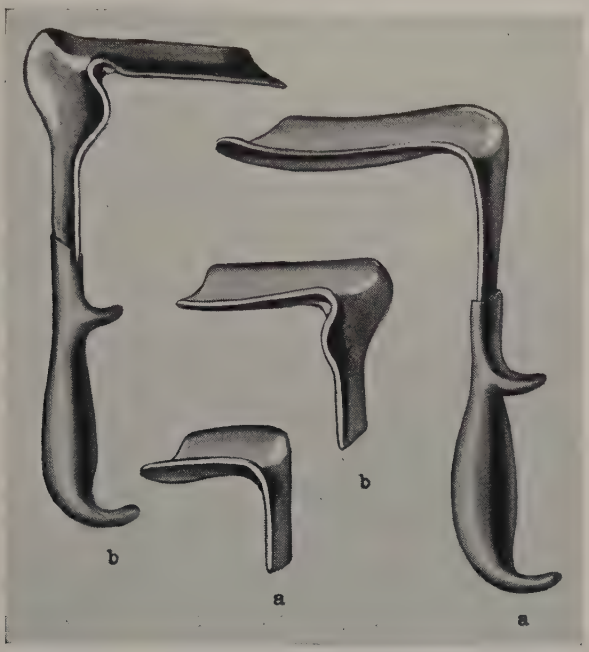


Fig. 5593.—Ott's Electric Vaginal (or Intra-abdominal) Speculum Retractor – with adjustable and detachable electric attachment. (Redrawn from Doederlein and Kroenig.)

is preferred by some. Silver wire of the kind mentioned, may be threaded directly upon a needle (as may fine silkworm filament), or may be used upon a carrier.

General Considerations in Operating Upon Fistulæ of the Female Genital Organs:



Figs. 5594 and 5595.—Doyen's Vaginal Retractors, a, a; Collin's Modification of Doyen's Retractors, b, b.

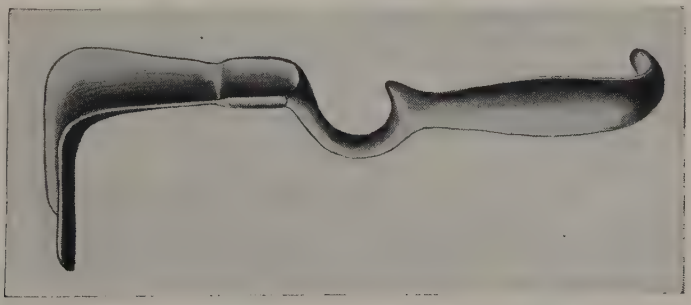


Fig. 5596.—Collin's Double-grip Vaginal Retractor.

Fig. 5597.—Sickle-shaped Vesicovaginal Knife. (Redrawn from Kelly and Noble.)

Primary union is almost an essential to success.

It is better to operate through normal than through cicatricial tissue, as the power of repair is greater.

The broader the raw edges or surfaces brought into contact for union, the greater the chance of success — and the denuded aspects to be sutured should meet without tension.

All strain upon the site of any suturing of the bladder wall should be relieved by the temporary use of a resident catheter introduced into the bladder. And, in the case of suturing the ureter, or ureteral orifice, the temporary use of a urethral catheter is usually indicated, which, in addition to relieving tension, also prevents the blockage of the narrow lumen by the swelling of the sutured part.

Sutures usually traverse the wound at right angles, but, independently of this, should be so placed as to best approximate the opposite edges, or surfaces, with least tension.

Formerly, great stress was laid upon so placing sutures as to nowhere penetrate the mucosa of the urinary tract — which, as a *rule*, should still be observed. It is probable that it is not of the crucial importance once considered — though it is best that when penetration must occur, it should be to the least degree possible, for, unquestionably, such stitches serve, to some degree, as capillary drains of the urine into the planes of the wound, and more so, if of other material than silver wire.

When the suturing of the fistulous site is finished its efficacy may be tested by reasonably distending the bladder with normal saline solution.

Classification of Fistulæ Involving the Female Generative Organs.—The most common types of these fistulæ (which, however, do not embrace all the possible combinations which may occur) are the following:

(*a*) **Fistulæ Intercommunicating Between the Female Generative Organs and the Ureters:**

(1) Uretero-uterine Fistulæ.
(2) Ureterovaginal Fistulæ.
(3) Uretero-vesico-vaginal Fistulæ.

(*b*) **Fistulæ Intercommunicating Between the Female Generative Organs and the Bladder:**

(1) Vesicovaginal Fistulæ.
(2) Vesico-uterine Fistulæ.
(3) Vesico-utero-vaginal Fistulæ.

(*c*) **Fistulæ Intercommunicating Between the Female Generative Organs and the Urethra:**

(1) Urethrovaginal Fistulæ.
(2) Urethro-vesico-vaginal Fistulæ.

(*d*) **Fistulæ Intercommunicating Between the Female Generative Organs and the Rectum:**

(1) Rectovaginal Fistulæ.
(2) Recto-vagino-vesical Fistulæ.

(*e*) **Fistulæ Intercommunicating Between the Female Generative Organs and the Intraperitoneal Intestinal Tract:**

Enterovaginal Fistulæ.

A. OPERATIONS FOR FISTULÆ INTERCOMMUNICATING BETWEEN THE FEMALE GENERATIVE ORGANS AND THE URETERS

(1) **Uretero-uterine Fistulæ, in General.**—Fistulous communication between the ureter and the uterus is very exceptional, and when it occurs it is usually between the ureter and the neck of the uterus (cervico-ureteral fistula). As its usual method of production is in child-bearing, the ureter cannot be compressed against the symphysis pubis unless the bladder is also so compressed — and Pozzi's theory of the formation of uretero-uterine fistula is that the fistula

is, through this pressure, or traumatism, first, a uretero-vesico-uterine fistula, after which the bladder communication becomes sealed off during cicatricial contraction, leaving the uretero-uterine communication.

Operation for Uretero-uterine Fistula by Abdominal Ureterocystostomy (Ureterocystoneostomy).—It is difficult to operate directly for uretero-uterine fistula _ that is, to correct the defect at its site, and restore the continuity of the ureter, owing to the position of the defect and the nature of the parts. The best procedure consists in performing an anastomosis by the abdominal route between the proximal end of the divided ureter and the adjacent wall of the bladder _ in the manner described in Vol. V, p. 4570.

(2) **Ureterovaginal Fistulæ, in General.**—Fistulæ between the ureters and the vagina were usually the result of pressure during child-bearing _ but, at the present time, the majority of them are due to instrumental traumatism during the removal of the uterus (either vaginal or abdominal hysterectomy).

Fig. 5598.—Relation of the Parts in Connection with Ureterovaginal Fistula _ a sound is seen passing upward, entering the vaginal opening of the fistula, and emerging through the artificially divided ureter. (Modified from Faure.)

When due to non-traumatic cause, it is usually the result of necrosis from interfered-with blood-supply. The general picture presented by ureterovaginal fistula is shown in Fig. 5598. The difficulty experienced in repairing such a fistula and retain a patulous ureter is not only because of the inaccessibility of the site, but because of the tendency of the repaired ureter to become blocked by cicatricial stenosis.

The general method of procedure in dealing with ureterovaginal fistulæ at the present time is to first perform a colpocystotomy at the site of or near to the site of the ureteral opening into the vagina _ which amounts to converting the ureterovaginal fistula into a uretero-vesico-vaginal fistula _ thus substituting a simpler for a more complex problem _ and then, after having secured communication between the ureter and the bladder, deal with the resulting uretero-vesico-vaginal fistula in the same manner as though it had originally existed _ the most difficult part of the technic having been accomplished, namely, anastomosis of the ureter with the bladder.

Operation for Ureterovaginal Fistula by Direct Autoplasty by the Vaginal Route.—The operation is difficult to carry out in the dome of the vagina and with a ureteral end which is usually deformed and retracted – but is sometimes successfully done in favorable cases. The vault of the vagina is exposed, and the vaginal opening of the ureteral fistula located. A ureteral catheter is carried into the bladder, and passed on into the dimpled vesical opening of the ureter (guided by a cystoscope) until blocked by its cicatricial ending (Fig. 5599, **a**). Upon the end of this sound a transverse incision is made, from within the vagina, through the bladder aspect of the anterior vaginal fornix – the incision dividing the vaginal opening of the ureter and the blind vesical ending of the ureter. The necessary dissection is carried out to expose the two ends of the ureter – after which the distal end of the ureteral catheter is drawn through the vesical remains of the ureter, and then passed on up the kidney end of the ureter (Fig. 5598). The vaginal opening of the

Figs. 5599 and 5600.—Operation for Ureterovaginal Fistula by Ureterocystostomy Through the Vaginal Route – Duehrssen: – **a**, The incision, showing the vaginal flaps or margins, retracted, and the ureter, dotted in black, ending in the fistulous opening – the line of the incision to be made through the ureter, dotted in white. The incision into the bladder is shown. **b**, Suturing the wound – the split margins of the ureteral end have been sutured to the margins of the vesical mucosa – the bladder opening is being closed by a buried tier of non-penetrating stitches – and the vaginal wound by marginal stitches.

ureter is dissected out – and the vaginal wound closed – the ureteral catheter remaining in position for several days, for urinary drainage, which the ureteral suturing might otherwise prevent.

Operation for Ureterovaginal Fistula by Ureterocystostomy by the Vaginal Route.—In this method the vaginal opening of the fistula (Fig. 5599, **a**) is circumscribed by an incision through the vaginal mucosa, which mobilizes a sufficient length of ureter to be turned into the bladder (Fig. 5600, **b**). The bladder is then incised, in or just below the cicatricial site of its former opening – and the fistulous end of the ureter, with its collar of vaginal tissue, is turned into the bladder. The raw surfaces made by incising the bladder wall are then sutured with fine chromic catgut to this collar of vaginal tissue (Fig. 5600, **c**). Before suturing the bladder about the ureter a ureteral catheter is passed through the bladder and a short distance beyond, toward the kidney, to be retained several days.

Operation for Ureterovaginal Fistula by Ureterocystostomy Through the Vaginal Route _ Duehrssen.—An incision of about 4 cm. ($1\frac{9}{16}$ inch) is made through the wall of the vagina, over the course of the ureter, extending above and below the vaginal opening of the fistula. A vaginal flap is turned back on each side, after which the bladder wall is incised in the same axis (Fig. 5599, **a**). The ureter is catheterized in advance through the fistulous opening. The fistulous end of the ureter is now split, upon its bladder aspect, for about 6 mm. ($\frac{1}{4}$ inch) _ to secure a ureteral opening which will not be closed in cicatricial contraction _ and the edges of the split ureteral end are then sutured to the margins of the vesical mucosa. The bladder opening is then closed by fine, non-penetrating catgut sutures, and the vaginal incision by marginal stitches (Fig. 5600, **b**).

Operation for Ureterovaginal Fistula by Ureterocystostomy Through the Vaginal Route _ Landau.—If the ureterovaginal fistula be not associated with a vesicovaginal fistula, a vesicovaginal fistula is made by the excision of

Fig. 5601.—Operation for Ureterovaginal Fistula by Ureterocystostomy Through the Vaginal Route _ Landau.

an elliptic piece of the vaginovesical wall (Fig. 5601) after which a ureteral catheter is introduced into the ureter and brought out through the urethra. Finally the uncised vaginal mucous membrane, first freshened around the site of the fistulous opening, is brought together by suture. The ureteral catheter remains in position for several days.

Operation for Ureterovaginal Fistula by First Converting It Into a Uretero-vesico-vaginal Fistula _ Simon.—A vesicovaginal opening is first made through the common vaginocystic wall, in a position near to the ureterovaginal fistulous opening _ and a ureteral catheter is passed into the ureter. When this is done an incision is made upon the catheter from the vesical aspect, enlarging the urethral opening _ and subsequently, to prevent its narrowing, catheterization is carried on for several days. Finally, the vesicovaginal fistula is closed.

Operation for Ureterovaginal Fistula by Inverting the Dissected Ureterovaginal Fistulous Opening Into the Bladder _ Mackenrodt.—An

artificial fistulous opening is made into the bladder, through the common vaginocystic wall, in the immediate neighborhood of the ureterovaginal fistulous opening. The latter opening is then circumscribed by an incision passing through the mucosa, and through this incision a periureteral flap is formed by separating the vaginal wall within this circumscribing incision from the bladder by flap-splitting – after which the periureteral flap, containing the ureterovaginal fistulous opening, is turned over, and into the artificial bladder opening, with the vaginal epithelium now corresponding with the vesical epithelium – and the margins of the former sutured to the margins of the latter – as the opening of a hole in the top of a stove is covered by its plate. The opening in the vaginal wall is then closed in two stages.

Operation for Ureterovaginal Fistula by Clamping the Vaginal Fistulous Opening and An Artificially Made Bladder Opening Into One – Bumm.—In close proximity to the vaginal opening of the ureterovaginal fistula, a vesicovaginal fistula is made – after which one blade of a Dupuytren bowel clamp is passed into the ureter, and the opposite blade into the bladder. After pressure necrosis has established free intercommunication between the bladder and the ureter, the vesicovaginal opening is closed by plastic procedure.

Dudley's Clamp Operation for Ureterovaginal Fistula is performed in very much the same manner as just described.

Operation for Ureterovaginal Fistula by Inverting the United Vaginal Fistulous Orifice and An Artificially Made Cystic Fistula Into the Bladder – Schede.—An artificial vesical fistula (colpocystotomy opening) is made close to the vaginal orifice of the ureterovaginal fistula – and the margin of the vesical mucosa around this opening sutured to the margin of the vaginal mucosa around the same opening. Both fistulous openings are now circumscribed by an incision through the vaginal mucosa – after which the fistulous tracts, surrounded by this isolated and freed area of mucous membrane, are inverted into the bladder and sutured.

Operation for Ureterovaginal Fistula by Inversion of the Vaginal Fistulous Opening Into the Bladder – Montgomery.—The following description of this technic is given in Keen's Surgery: – "The scar (of the vaginal opening of the ureterovaginal fistula) was encircled by an incision ½ inch below the summit of the vaginal vault. A peripheral flap following the line of this incision was now dissected down about a half-inch in width. Guided by a Pratt bougie introduced through the urethra the vesical wall was pushed into the raw surface bordering the undenuded central area anteriorly, and was then incised transversely to the extent of ½ to ¾ inch. The edge of the anterior vesical flap was drawn into view with a hemostat. Chromic catgut sutures were now introduced into the flap from below upward, carefully avoiding penetration of the vesical mucous membrane. These same sutures were then carried from above downward through the denuded surface on the posterior wall of the vagina, so that when tied, the vesical mucous membrane was continuous with the undenuded central area, thus making the latter, with the ureteral opening, a part of the interior of the bladder. Especial care was exercised in closing the angles of the opening. After testing the line of suture by vesical distention with sterile salt solution, the vaginal flaps were united transversely with a continuous chromic catgut suture. Hemorrhage during the operation was controlled by repeatedly infiltrating the tissues with adrenalin solution, 1 : 3000. Upon the completion of the operation, a self-retaining soft catheter was introduced. This was removed in three days, after which the patient was catheterized every four hours for a week longer." This technic was successfully performed upon three patients.

Operation for Ureterovaginal Fistula by Inversion of the Vaginal

Opening Into the Bladder.—An oval or semicircular area is denuded, from 6 to 8 mm. ($\frac{1}{4}$–$\frac{1}{3}$ inch) in width, around the part of undenuded vaginal mucosa, the center of which is represented by the fistulous opening. The denuded surfaces are then brought together by suture – in such a manner as to invert the vaginal fistulous orifice of the ureter into the bladder. The ureteral opening is thus eliminated, leaving a vesicovaginal fistula – which may be dealt with in the ordinary manner (v. pp. 325–355) – unless, happily, a small common uretero-vesico-vaginal opening may be closed at one sitting, in the act of the vaginal suturing.

(3) **Operation for Uretero-vesico-vaginal Fistula by Vaginal Flaps** – Pozzi.—The technic here described is one which Pozzi successfully applied to a case in which eleven preceding operations had failed – but, naturally, is only available when a ureterovaginal fistula also communicates with the bladder. A transverse incision is made through the vaginal mucosa, each half of the incision extending 1 cm. ($\frac{12}{16}$ inch) beyond the fistulous opening, through the center of which the incision passes. At each end of the transverse incision a vertical incision is made – thus forming an upper and lower flap by the H-shaped incision. These incisions only go through the common vaginovesical wall far enough to split the septum for one-half of its thickness – thereby enabling two small flaps to be raised – which were sutured together over the fistulous opening by means of three buried silver wire sutures, followed by three superficial stitches.

Operation for Uretero-vesico-vaginal Fistula by Splitting the Fistulous End of the Ureter.—The fistulous end of the ureter is located in the scar tissue of the vagina – and its vesical aspect is split upward for about 1.2 cm. ($\frac{1}{2}$ inch). The margins of the split ureter are allowed to heal separately, so that, in the act of healing, the orifice of the ureter will be carried further upward into the bladder. The ureteral opening in the vagina is thus eliminated, as in the preceding method – leaving a vesicovaginal fistula to be dealt with in the usual manner.

B. OPERATIONS FOR FISTULÆ INTERCOMMUNICATING BETWEEN THE FEMALE GENERATIVE ORGANS AND THE BLADDER

1. Vesicovaginal Fistulæ, in General.—This variety of fistula was formerly the one most frequently encountered, but is now of rarer occurrence, as far as a resulting complication of labor is concerned. It consists of a pathologic opening between the bladder and vagina. Its most frequent cause is the long-continued pressure of the child's head against the pelvis, with the bladder between, especially in impaction of the head with delayed delivery. The fistula is caused by the final sloughing away of the devitalized part of the common vesicovaginal septum. Fistulæ may also occur from pessaries, hysterectomy operations, bladder drainage, and from pathologic sloughing of the septum (as from extending cancer).

The phosphatic incrustations which sometimes cover the margins of the fistula may be counteracted by giving the patient benzoic acid internally, as part of the preparation for operation – together with the mechanical removal of the deposits by swabbing and douching. For the destruction of intravaginal organisms, it has been suggested (as mentioned by Hellier) to smear a vaginal pessary with yeast and syrup and introduce it overnight – the yeast fungi, resulting from the fermentation, killing all bacteria in the frothy fluid which results – this being irrigated out – and the process repeated. Ordinary methods of irrigation with antiseptic solutions, however, suffice.

Some of the chief methods of operating for vesicovaginal fistulæ will be here given.

Operation for Vesicovaginal Fistula by Oblique Marginal Denudation and Non-penetrating Suture _ Sims' Operation.—This is the classic operation for vesicovaginal fistula. The patient is placed in Sims' position, with a posterior vaginal speculum retracting the posterior vaginal wall, and the field illuminated by a head mirror (Fig. 5602). (Some Operators prefer the supported knee-chest posture.) The denudation of the margins of the fistula is made in an oblique manner _ the ellipse, or circle, being greater upon its vaginal aspect than at its bladder-directed end _ but comes out into the tract of the fistula just below the mucous membrane, without including the mucosa in the knife cut, or scissors cut. A sectional view of this conical denudation is seen in Fig. 5603. The denudation is accomplished by steadying

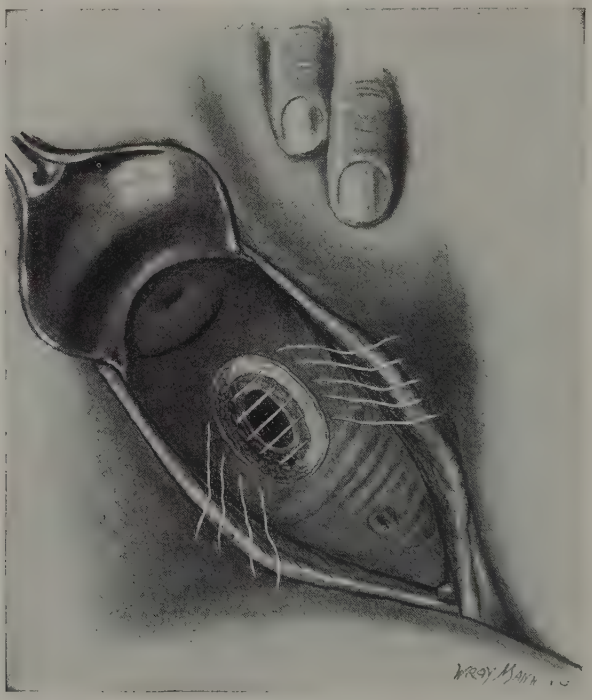


Fig. 5602.—Operation for Vesicovaginal Fistula by Oblique Marginal Denudation and Non-penetrating Suture _ Sims' Operation _ I; _ The margins of the fistula are pared in a beveled fashion at the expense of the vaginal surface. Interrupted, non-penetrating sutures are introduced through the vaginal wall, making their entry just beneath the vesical mucosa. The patient is in Sims' left genupectoral posture.

the vaginal aspect with long, fine, rat-toothed forceps, and then, after first outlining the incision, making the oblique section with a narrow, straight knife (Fig. 5604), or with scissors (Fig. 5605) _ so beveling the margin in either case at the expense of the vaginal aspect of the wound, as to bring the cutting instrument out just below the mucosa, without cutting it. The general direction of the denudation may be oval, elliptic, or circular _ with the main axis directed anteroposteriorly, transversely, or obliquely. When the margins have been satisfactorily pared, so that sufficiently broad surfaces are furnished, and provision made for easy, untensed approximation, the stitches are introduced _ usually in a direction at right angles to the main axis of the denudation, but, in any event, in a direction which will bring the parts together without

Fig. 5603.—The Same – II; – Sectional view; – The margins of the fistula are pared, or actually excised, around the area indicated by dotted lines – the beveling being at the expense of the vaginal aspect. The sutures pass through the vesicovaginal wall, except carefully excluding the vesical mucosa.

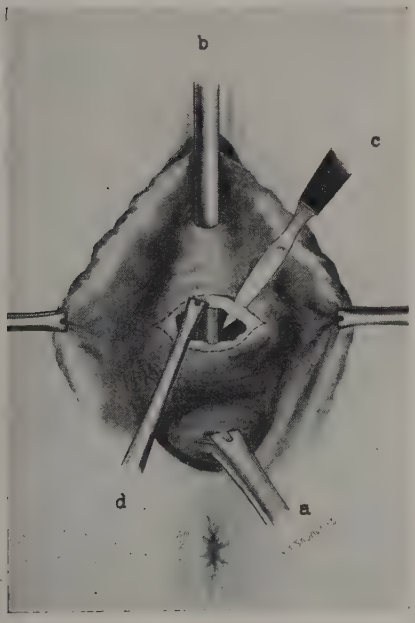


Fig. 5604.—The Same – III; – Making the denudation by knife: – a, Uterus drawn down to better expose the anterior vaginal wall; – b, sound here introduced into the bladder through the urethra (not a necessary part of the technic); – c, excising the ragged edge of the vaginal aspect of the fistula in a transversely elliptic manner, while the margin of the fistula is steadied by self-retaining tenaculum forceps.

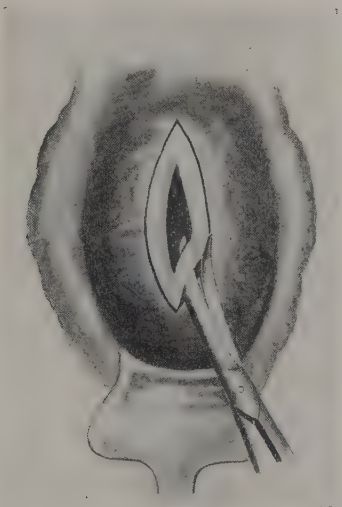


Fig. 5605.—The Same – IV; – Making the denudation by scissors; – The margin of the fistula is steadied by forceps, while scissors obliquely bevel the edge, at the expense of the vaginal aspect.

tension. These stitches enter upon the vaginal aspect of one side (Fig. 5606), a short distance from the pared margin _ emerge upon the margin, beneath the mucosa (without penetrating the latter) _ to repeat the maneuver, in the reverse order upon the opposite side. These stitches, whether of pliable and

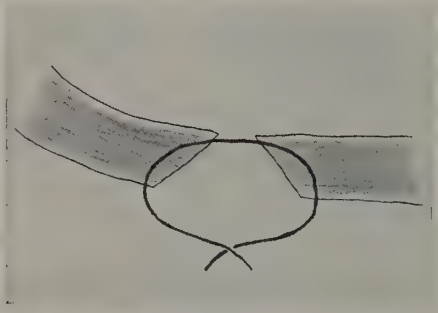


Fig. 5606.—The Same _ V; _ Placing the sutures through the vesicovaginal septum, exclusive of the vesical mucosa.

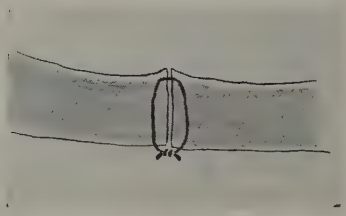


Fig. 5607.—The Same _ VI; _ Sectional view of a tied suture.

knotable fine silver wire, or silkworm filament, are carried through the wound margins directly threaded upon a needle, or are drawn through upon silk carriers. When tied, the relatively broad and slightly diverging oblique surfaces are brought together so that their surfaces become parallel (Fig. 5607) _

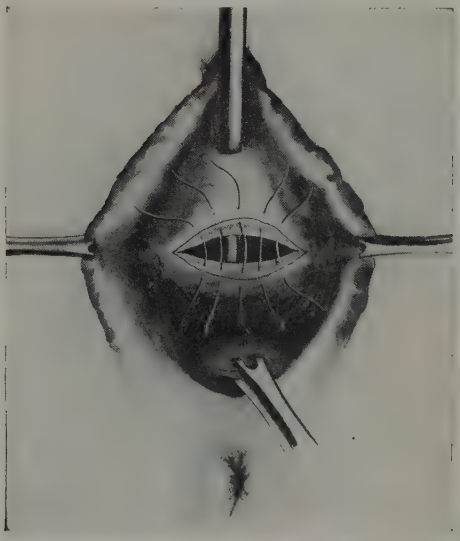


Fig. 5608.—The Same _ VII; _ Vaginal view of sutures placed through the lips of the vesicovaginal wall, including all of its thickness except the vesical mucosa. A sound passed through the urethra is here seen in the bladder.

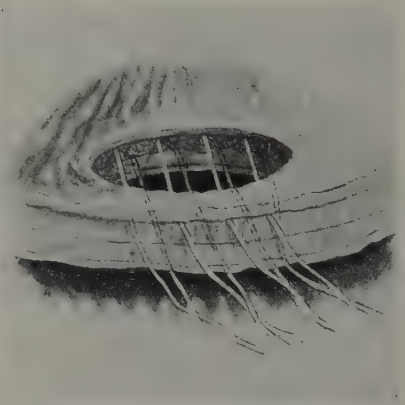


Fig. 5609.—The Same _ VIII; _ Combined sectional and vesical surface view of the fistula and the placed sutures. The bladder surface is uppermost.

carefully avoiding constriction of their margins in the tying of the stitches, the tightness of which will be increased by the reactionary swelling. A vaginal surface view of the sutures is seen in Fig. 5608 _ and a combined vesical surface and sectional view in Fig. 5609. From four to five sutures to the 2.5 cm.

(1 inch) are usually employed — each suture entering about 3 mm. ($\frac{2}{16}$ inch) from the vaginal margin. The correct technic is that the initial incision should be made at a right angle to the vaginal mucosa, after which the knife should be directed obliquely, so as to pass through the entire vesicovaginal septum, *except* the vesical mucosa, beneath which (and not through which) it should emerge — and that, in suturing, the stitches should, likewise, not enter the vesical mucosa. Nevertheless, in good writings, both of these technical points are sometimes found disregarded, and the directions given that the denuding incision and the sutures included the vesical margin. (Indeed, in one instance, the same writer, in one work, states: — "The denudation must extend into the vesical mucosa on all sides" — and, in another work, writes: — "The edges of the fistula should be pared on the vaginal surface entirely; this creates a freshened area from 5 to 6 or 8 mm. in breadth, extending down to but not including the mucous membrane of the bladder.") Inclusion of the vesical mucosa, in incision and suturing, is a feature of the Simon operation to be next described, in contradistinction to the omission of these two steps, as two salient features of the Sims technic. The disparities found in descriptions covering the inclusion or avoidance of the vesical mucosa, in both incising and suturing, are, however, probably not of paramount practical importance.

While fine pliable silver wire and silkworm filament are used by some, chromic catgut and silk are used by others.

When the margins of the fistula cannot be approximated by tenacula, as determined by preliminary test, before operation, the Sims technic will prove less satisfactory than some other procedure — unless the margins may be brought easily together by means of relaxing incision made partly through the vaginovesical septum in the neighborhood.

A careful examination of the denuded surface must be made, and if any islands of uncut mucosa are found, these are snipped off — bleeding being stopped by gauze-pressure to locate them, as their presence interferes with satisfactory union.

The placing of the sutures, whether directly or by carrier, is aided by Emmett's hook, with which counterpressure may be exercised against the needle point.

A self-retaining catheter is usually introduced at the end of the operation, and maintained for seven or eight days — occasionally removing it for cleansing. A light gauze dressing is usually placed in the vagina. Often the retention of a catheter is omitted — the patient either being allowed to urinate voluntarily — or the urine being drawn at intervals. The bowels are generally kept constipated for about three days. The sutures are removed in twelve to fifteen days.

Incising the vesical mucosa freely has been followed by hemorrhage serious enough to destroy life — and, short of this, the bladder has expelled large clots through the wound into the vagina, breaking down the wound.

The longer axis of the denuding incision may be anteroposterior, or transverse.

One or both ureters have been included in the suturing — an exceedingly serious mishap.

The technic above described is applicable to average vesicovaginal fistulæ — special measures being preferable for large or unusual fistulæ.

Operation for Vesicovaginal Fistula by Rectangular, Marginal Denudation and Penetrating Suture — Simon's Operation.—The salient features in which this technic differs from Sims', just described, is, that the denudation of the margins of the fistula is made by section of the parts directly at a right angle to their plane — and that the sutures by which these margins

are subsequently approximated, penetrate through the entire thickness of all the tissues of the vesicovaginal septum, including the vesical mucosa. A sectional view, if the fistula and the lines by which its margins are excised, is shown

Fig. 5610.—Operation for Vesicovaginal Fistula by Rectangular, Marginal Denudation and Penetrating Sutures _ Simon's Operation _ I; _ Lines of section.

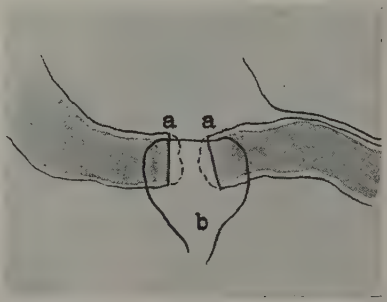


Fig. 5611.—Freshened walls of the fistula, which the sutures should be shown entirely penetrating. The excised margins are shown in white.

in Fig. 5610 _ and the position of the sutures in Fig. 5611. The other features of the operation are, in all practical respects, the same as those described in the preceding operation.

Fig. 5612.—Operation for Vesicovaginal Fistula by Oblique or Rectangular Denudation, Followed by Double-tier, Non-penetrating Sutures _ I: _ a, Non-penetrating, buried sutures passing through the muscularis of the vesicovaginal wall, beneath the mucosa of the bladder; _ b, b, suture of the vaginal mucosa and submucosal connective tissue.

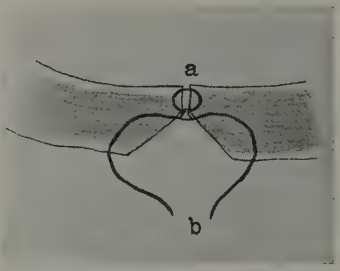


Fig. 5613.—The Same _ II: _ a, The first buried, non-penetrating stitch, tied; _ b, the second suture, to be tied on the vaginal surface.

Operation for Vesicovaginal Fistula by Oblique, or Rectangular, Denudation, Followed by Double-tier, Non-penetrating Sutures.—The method of paring the margins of the fistula is either by oblique section

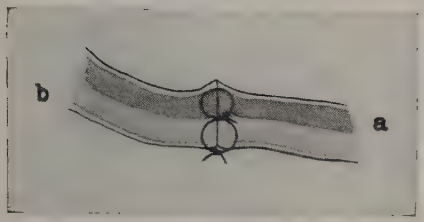


Fig. 5614.—The Same _ III; _ The tied sutures: _ a, Subvesicular; _ b, vaginal.

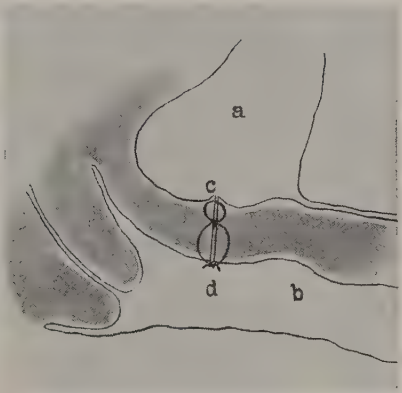


Fig. 5615.—The Same _ IV; _ The completed operation: _ a, Bladder; _ b, vagina; _ c, buried, subvesical suture; _ d, vaginal suture.

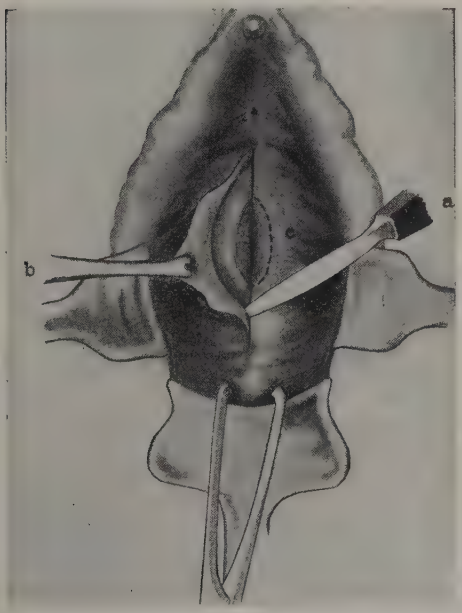


Fig. 5616.—Operation for Vesicovaginal Fistula by Flap Splitting and Gliding, with Suture of Vesical Wall and Vaginal Wall in Separate Layers _ Method I; _ Incising the margin of the fistula, c, by an incision surrounding it, and extending above and below it for a short distance in the median line. The vaginal and vesical walls are being separated, in their connective-tissue plane, by knife and forceps (though more safely accomplished with Mayo scissors).

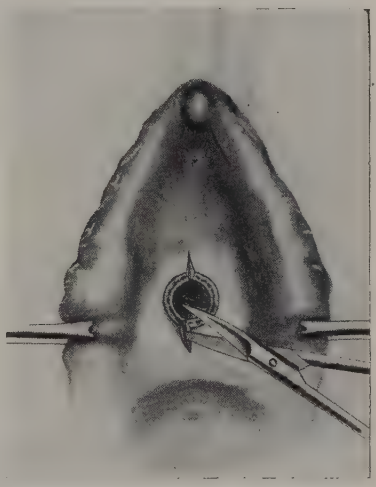


Fig. 5617.—The Same _ II; _ A vertical incision is made through the center of the fistulous area, beginning above and ending below it, and passing half-way through the vesical wall. The fistula is circumferentially excised _ and the margins split by Mayo scissors for mobilization. The margins of the fistula may be first excised.

(v. p. 326), or rectangular section (v. p. 329). When the denudation has been accomplished two tiers of sutures are placed. The first tier, of fine chromic catgut, is buried and non-penetrating _ that is, the stitches pass through the

upper aspect of the vesicovaginal septum, except that they nowhere pierce the vesical mucosa. The surface view of such a suture is seen in Fig. 5612, **a** – and the sectional view in Fig. 5613, **a**. The lower tier of sutures, which are

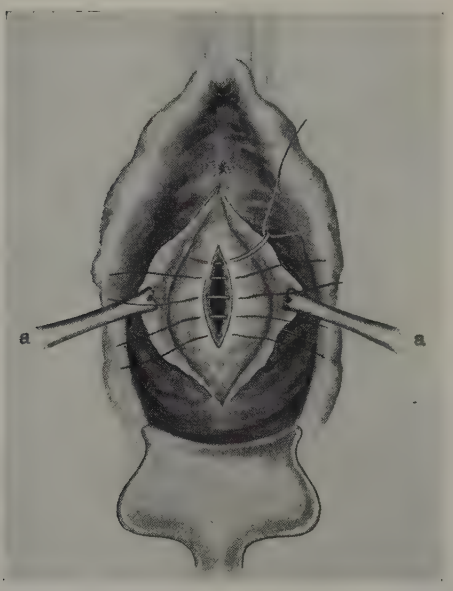


Fig. 5618.—The Same – III: – **a**, **a**, The vaginal flaps are being retracted laterally by tenaculum forceps, while interrupted, non-penetrating sutures are being placed between the lips of the elliptic bladder wound.

Fig. 5619.—The Same – IV: – **a**, The first tier of non-penetrating sutures has been tied; – **b**, a second tier of buried, non-penetrating stitches is being inserted; – **c**, interrupted sutures of the vaginal margins.

penetrating and which are also usually of fine chromic catgut, but which may also be of pliable (knotable) fine silver wire or silkworm filament, enter and emerge to one side of the margins of the vaginal mucosa, passing through about

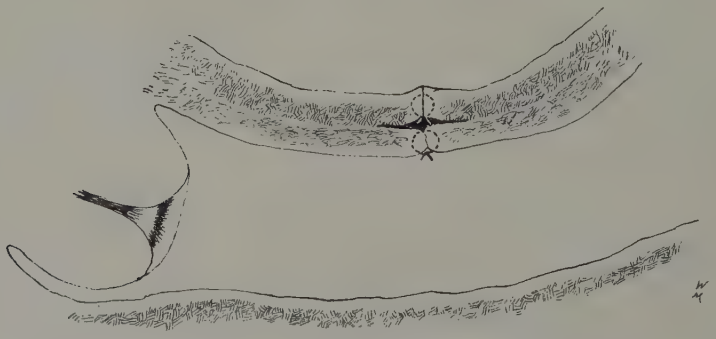


Fig. 5620.—The Same – VI; – Sectonal view of the layer of sutures, with intervening area of mobilization

one-half of the total thickness of the vesicovaginal septum (v. Fig. 5612, **b** and 5613, **b**). These sutures, when tied, present the appearance shown in Fig. 5614, **a** and **b**. All other features of the operation are the same as des-

cribed under Sims' operation (v. p. 326) – including preliminary and after-treatment. The completed operation is seen in Fig. 5615.

Operation for Vesicovaginal Fistula by Flap Splitting and Gliding, with Suture of Bladder and Vagina in Separate Layers.—This method involves little, if any, loss of tissue – is easily performed – and is a very generally, if not the most generally, applied technic at the present time, being applicable, as a rule, to minor or major grades of vesicovaginal fistulæ.

An incision, by means of a sharp knife, is made around the margins of the fistula into the connective-tissue plane between vagina and bladder. The liberating incision extends a short distance above and below the fistula. The vaginal and vesical walls are then separated from each other in this plane,

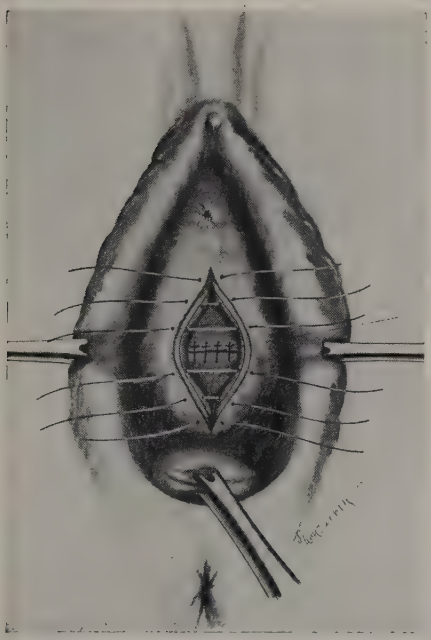


Fig. 5621.—The Same – V; – Vaginal and vesical wounds being closed in opposite directions; – A transverse suture line of non-penetrating stitches is shown of the bladder wall, following the detachment of the fistula by blunt dissection, in the connective-tissue plane, and the paring of its margins. The vaginal wound is sutured in the opposite direction.

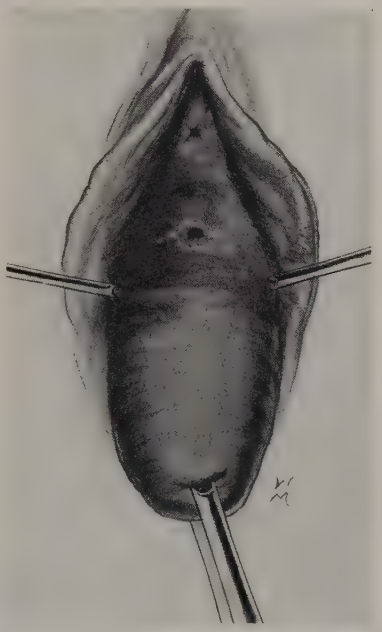


Fig. 5622.—Operation for Vesicovaginal Fistula by Flap Splitting and Purse-string Sutures – I; – The site of the fistula is surrounded by elliptic incision, with lateral extensions – to denude the margins of the fistula and to open up the connective-tissue plane between vaginal and vesical walls.

either by combined knife and blunt dissection (Fig. 5616), or by Mayo scissors and blunt dissection (Fig. 5617). The bladder is better safeguarded by the latter technic. It is of practical importance not to inadvertently get into the plane between vesical muscularis and mucosa, separating these layers, rather than the whole vaginal wall, from the whole bladder wall – the latter being more easy of accomplishment if the separation be begun above the level of the fistula. The margins of the vesical opening are then limitedly denuded and sometimes need to be but little disturbed. Union is promoted by seeing that the fistulous opening has clean, raw margins. And the margins of the opening in the separated vaginal wall will usually require to be similarly treated. The separation between vagina and bladder should be sufficient to enable the

margins of the bladder wall to come together without tension – and, when this is tried, and found not to be the case, the separation should be carried somewhat further. The margins of the bladder wound are now sutured with fine, non-penetrating catgut sutures (Fig. 5618). In small, simple fistulæ this single tier of buried sutures will usually suffice – but, under other circumstances, a second tier of buried sutures of the same material, burying in the first tier, may be used (Fig. 5619). These may be ordinary sutures, or of the Lembert type. Finally, marginal sutures, through the edges of the mobilized vaginal flaps, are inserted in the manner shown in the last illustration. These are sometimes of fine silkworm filament – or silk – but may be of chromic catgut. A sectional view of the sutured wound is seen in Fig. 5620.

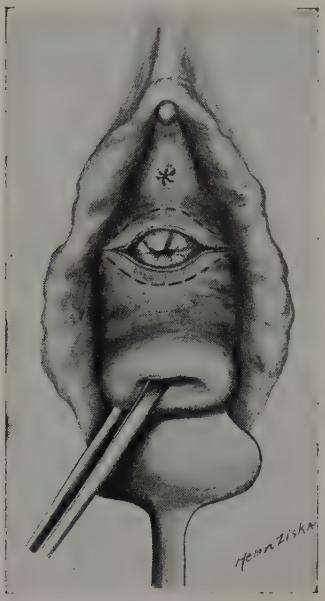


Fig. 5623.—The Same – II; – The margin of the fistula has been pared, and flaps provided by paramarginal splitting. The distance to which the flaps are mobilized is indicated by dotted lines.

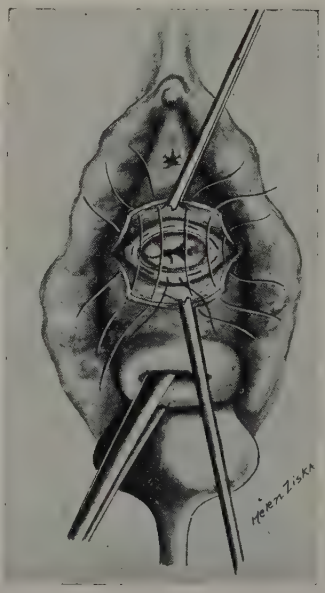


Fig. 5624.—The Same – III; – The non-penetrating purse-string suture in the margins of the fistulous vesical orifice, ready to be tightened – and the interrupted sutures in the margins of the vaginal flaps, ready to approximate them over the inverted opening.

Sometimes the vesical wound is closed in one plane (anteroposteriorly) and the vaginal flaps in another (transversely) – or *vice versa* – whichever method promises to secure the best closure (Fig. 5621). More even approximation of the parts, however, is usually secured by coincidence of the lines of suture.

If there be any question as to wounding the ureters, because of the juxtaposition of the fistula to their known sites, ureteral catheters should be previously inserted – and careful technic observed in the subsequent cutting.

If the fistulous opening be adherent to the bones of the pubis, considerable difficulty is added – for the adhesions must be first freed before an attempt be made to bring the margins of the fistula together – which may require either a paravaginal or suprapubic incision and exposure.

This method is especially applicable to larger fistulæ, in which the approxi-

mation of the margins would be difficult or impossible to accomplish without too much tension.

Operation for Vesicovaginal Fistula by Flap Splitting and Purse-string Suture.—As far as the incision (Fig. 5622) and the making of the flaps by splitting the vaginal from the vesical wall are concerned, the procedure is the same as in the method last described. The margins of the fistula are

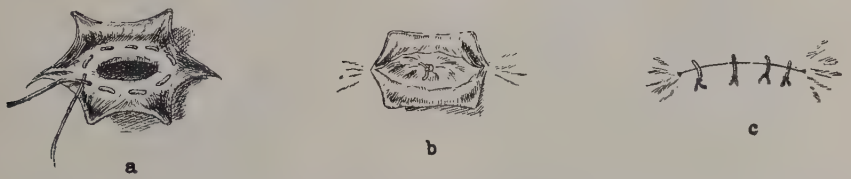


Fig. 5625.—The Same _ IV, V, VI: _ **a,** The flaps are held apart and a purse-string suture placed in the bladder wall around the pared fistula, through all coats except the mucosa; _ **b,** the purse-string suture is tied, puckering the freshened margins together; _ **c,** the vaginal flaps are now sutured _ either by overlapping _ or by simple approximation, as above (excising any redundancy of flap margins).

limitedly pared, and the vaginal flaps are dissected backward from the margins of the fistula for a distance indicated in the special case, that the sutured borders may come together without tension (Fig. 5623). The axis of the incision may correspond with that of the vagina, or may cross it transversely. The incisions extending from the marginal paring of the fistula, in the direction of the axis of the wound, pass, at each end, a short distance beyond the

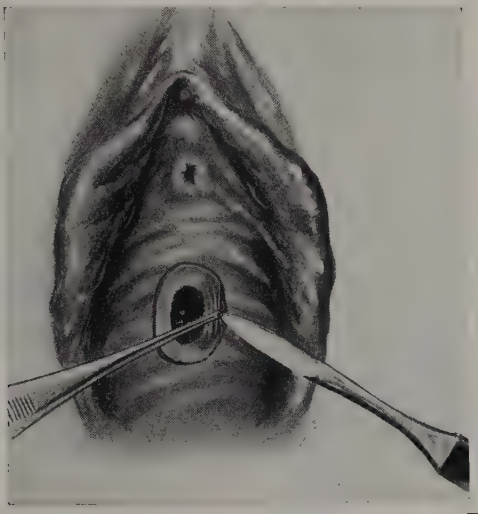


Fig. 5626.—Operation for Vesicovaginal Fistula by Flap Splitting, Followed by Approximation of Both the Everted and Glided Flaps _ Ferguson's Technic _ I; _ One-half the width of the collar-flap, between the circumscribing incision and the margin of the fistula, is mobilized in the intervaginovesical plane, in the direction of the fistula _ carefully preserving a marginal hinge.

ends, as seen in the illustration. When the flaps have been retracted a non-penetrating, buried, purse-string suture of chromic catgut is carried into the substance of the vesical wall, but not through the mucosa (Fig. 5624) _ and tied _ after which the margins of the vaginal flaps are brought together over the tied purse-string suture by interrupted marginal stitches. The steps of the operation are shown, diagrammatically, in Fig. 5625, **a, b, c.**

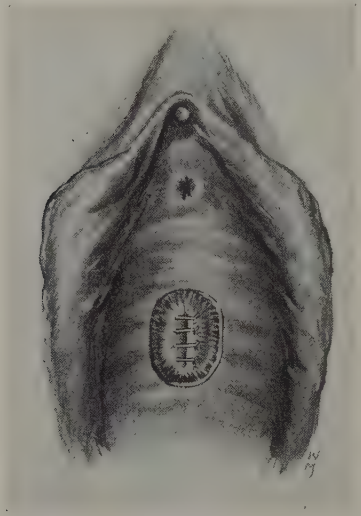
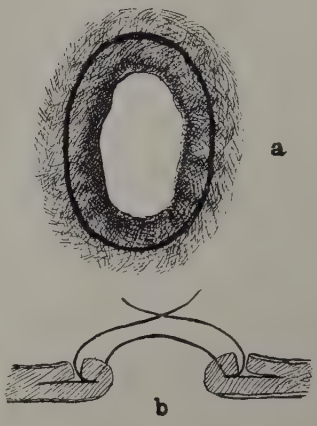


Fig. 5627.—The Same _ II; _ The peripheral or outer portion of the circular flap is raised and turned toward the center of the fistula, directing the vaginal mucosa toward the bladder _ and holding the margins together by means of non-penetrating sutures placed in a vertical line.



Figs. 5628 and 5629.—The Same _ Diagrammatic views of Stages I and II: _ a, Surface view of circular flap to be raised around the fistula, incised from the vaginal mucosa into the connective-tissue plane; b, cross-section of the margin of the fistula, with the incised cuff-flap ready to be turned toward the bladder.

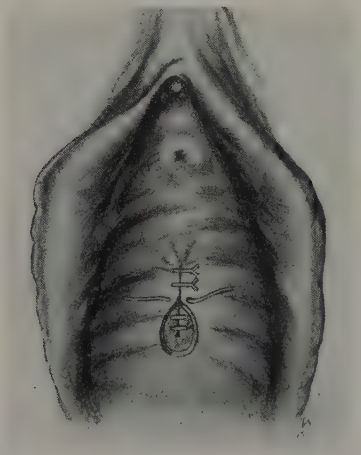
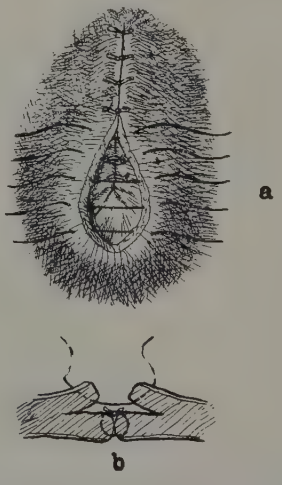


Fig. 5630.—The Same _ III; _ The vaginal wall, undercut as far as necessary, is then sutured together in the median line, over the first tier of sutures.



Figs. 5631 and 5632.—The Same; _ Diagrammatic views of Stages I, II, and III: _ a, Sutures are placed in the inwardly turned flap and tied _ and the mobilized adjacent margins, from which the collar-flap is cut, are in the act of being drawn over the previously sutured flap; _ b, cross-section of the sutured parts.

Operation for Vesicovaginal Fistula by Flap Splitting, Followed by Approximation of Both the Everted and Glided Flaps _ Ferguson's Technic.—In this procedure the margins of the flap are not denuded _ indeed, to

freshen them would weaken the hinging-back technic of the operation. A circumscribing incision is made around the fistula, through the vaginal wall, into, but not beyond, the connective-tissue plane between vaginal and vesical walls, and at a distance from the margins of the fistula calculated to furnish a sufficient amount of flap tissue to cover-in the fistulous opening in question. This is best made by means of knife and forceps (Figs. 5626 and 5628, **a**). The freeing of the collar-flap is then carefully carried on inward, toward the fistula – but only half of the way between the incision and the margin of the

Fig. 5633.—Braquehaye's Operation for Vesicovaginal Fistula by Inversion of the Mobilized Fistulous Opening Into the Bladder, Reinforced by Double-tier Suturing – Fergusson-Braquehaye Technic – I; – The site of the fistula is outlined by an elliptic incision – the ends of which are continued transversely beyond into the vaginal wall.

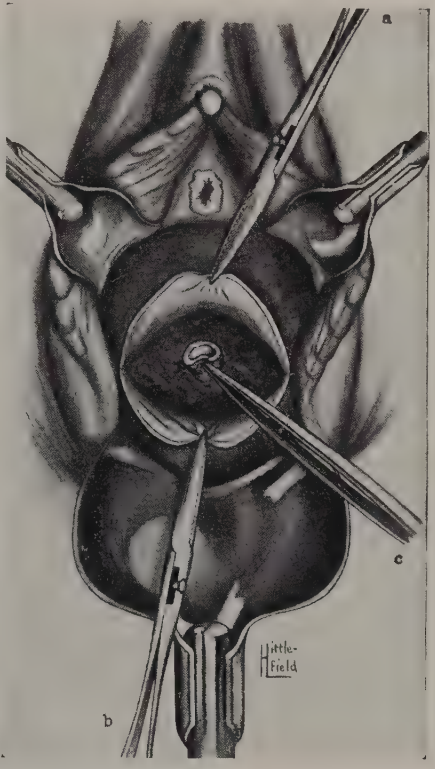


Fig. 5634.—The Same – II; – The upper and lower vaginal flaps have been raised, **a** and **b**, – and the fistulous tract has been freed by dissection and is being inverted into the bladder as a plug, **c**.

fistula. The eversion is inward, rather than outward, but not an inversion *into* the bladder, as in the following operation. This is the special feature of the operation, and, unless carefully conducted, the mobilization may be carried directly into the otherwise sealed margin of the fistula (which is to serve as the circular hinge) – probably involving the abandonment of the entire technic, and the substitution of another (for urine would infiltrate the wound, unless the communication between bladder and wound could be safely sutured off). The outer margins of the collar-flap are now turned inward, over the fistulous opening, and sutured together (Fig. 5627; see also Fig. 5629, **b**).

The margins of the vaginal wall surrounding the area from which the collar-flap was raised are, in turn, mobilized, but outward – after which their edges are brought together by marginal stitches (Figs. 5630 and 5631, 5632, **a** and **b**.

Operation for Vesicovaginal Fistula by Inversion of the Mobilized Fistulous Opening Into the Bladder, Reinforced by Double-tier Suturing (Variously Described as the Braquehaye-Albarran or Braquehaye-Fergusson Technic).—The fistulous opening is surrounded by an elliptic incision whose main axis is lateral. This is placed at a short distance outside of the margins of the fistula – and, through it, the neck of the fistula, together with the col-

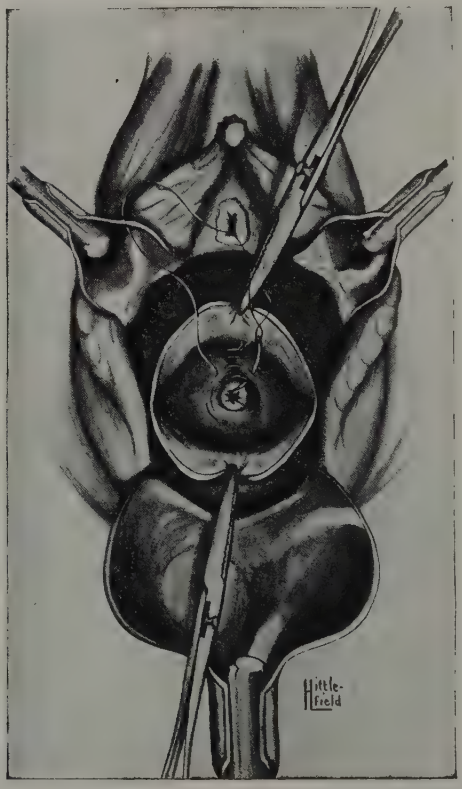


Fig. 5635.—The Same – III; – The mobilized fistula tract has been inverted into the bladder – and vaginal wall is being sutured, axially, over the fistula, by non-penetrating Lembert stitches – after which the mobilized vaginal flaps will be sutured together transversely.

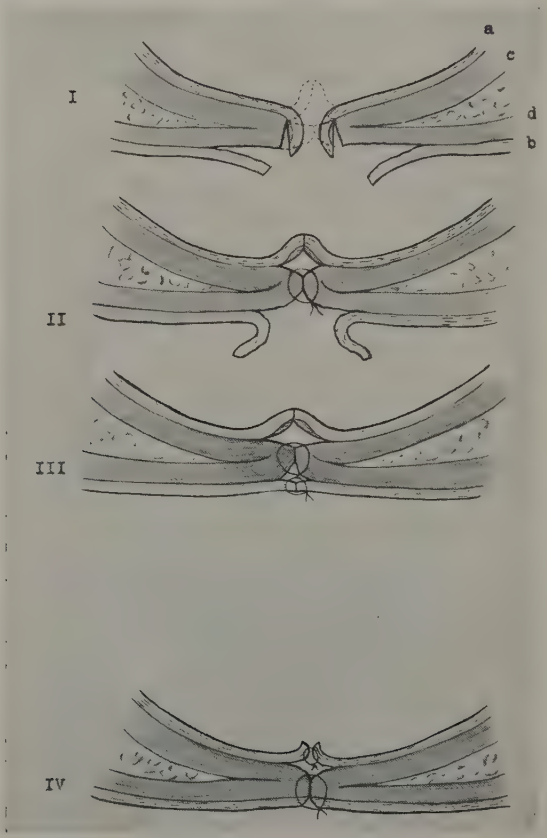
laret of tissue represented by the extent of tissue between its wall and the incision, is dissected to, but not through the mucosa of the bladder – the ends of the elliptic incision, which include these tissues, being extended transversely through the vaginal wall, a short distance beyond the ends of the ellipse, into the connective-tissue plane between vagina and bladder (Figs. 5633 and 5637, I). The upper and lower vaginal flaps are then freed in the intervaginovesical plane. The isolated fistulous tract is then seized with forceps and inverted entirely into the bladder cavity (Fig. 5634; see also Fig. 5637, I, the dotted pyramidal intravesical elevation). The bladder wall is then brought together by non-penetrating continuous Lembert suturing, in

such a manner as to bury in the inverted neck of the fistula by a line of suturing extending in the axis of the vagina (Figs. 5635 and 5638, II). The margins of the vaginal flaps are then approximated by interrupted sutures which run anteroposteriorly, forming a transverse vaginal scar _ as shown in Figs. 5636 and 5639, III.

In Fig. 5640, IV, is shown Braquehaye's original technic, in which stitches are put through the raw walls of the vaginal aspect of the fistula and tied, before the inversion of the fistulous tract into the bladder _ after which the rest of the vaginovesical opening is closed in one layer.

Fig. 5636.—The Same _ IV; _ The vertical line of buried vesical sutures is seen in the gap between the vaginal flaps which are in the act of being brought together in a transverse line of union.

Operation for Vesicovaginal Fistula by Outward Flap Splitting from the Undenuded Fistulous Margins (Operation by Dédoublement).—Without freshening the margins of the fistula, the common vaginovesical wall is split in its middle (Fig. 5641) _ the splitting being begun upon the free aspect of the margin of the fistula, and extended outward, equally in all directions, for a distance which will suffice to furnish substantial abutments for approximation. In the plane of the splitting, the collar-like flaps are separated, bladder-ward and vagina-ward. Sutures are then so placed as to leave either an anteroposterior or transverse scar, according to the circumstances of the individual case _ entering the vaginal surface of the vaginal flap near its edge, and coming out in the margin, but not penetrating the mucosa of the vesical flap (Fig. 5642). Instead of employing a single row of interrupted sutures



Figs. 5637–5640.—Fergusson-Braquehaye's Operation for Vesicovaginal Fistula, Shown in Section: _ a, Bladder mucosa; _ b, vaginal mucosa; _ c, bladder muscularis; _ d, vaginal muscularis. I corresponds with Fig. 5634, _ II with Fig. 5635, _ III with Fig. 5636, and IV shows Braquehaye's original operation, in which the dissected fistula is sutured before inversion into the bladder _ after which all the underlying and surrounding vesicovaginal tissues are sutured as a single layer.

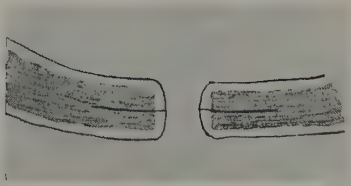


Fig. 5641.—Operation for Vesicovaginal Fistula by Outward Flap Splitting from the Undenuded Fistulous Margins _ (Operation by Dédoublement) _ I; _ Splitting the common vaginovesical wall outward, in its midplane.

Fig. 5642.—The Same _ II; _ The vesical and vaginal aspects of the split margins are drawn apart, and the increased raw surface for approximation is being brought together by a single nonpenetrating stitch.

placed, as just described, two tiers may be employed _ the first being a nonpenetrating tier of the upper part of the vesical flap (Fig. 5643) and the lower

tier being placed as just described (the same figure, **b**). A surface view of this last (double-tier) method of suturing is seen in Fig. 5644.

Operation for Vesicovaginal Fistula by Inward Flap Splitting from an Outlying, Circumscribing Parafistulous Incision.—This method of

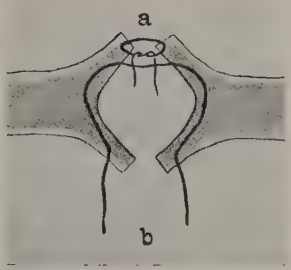


Fig. 5643.—The Same – III; – The broadened raw surfaces are being brought together by a subvesicular buried tier of suturing, followed by a vaginal tier.

procedure may be considered as allied with the general Braquehaye technic, already described. The incision circumscribing the fistulous opening is made at a distance from the margins of the fistula somewhat greater than usual.

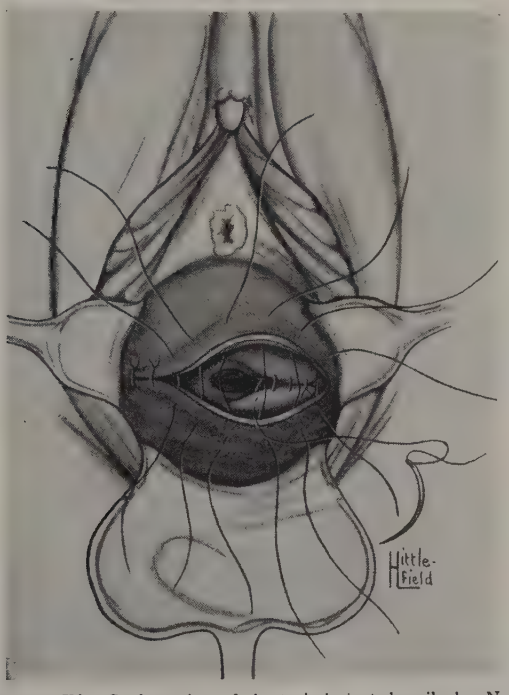


Fig. 5644.—The Same – IV; – Surface view of the technic just described; – Non-penetrating, buried sutures are closing the vesical aspect of the flap – and the interrupted sutures of the vaginal aspect of the flap are being placed.

The cut is first made into the common vaginovesical wall at a right angle to the vaginal aspect, and, when the midplane of this wall is reached, it is directed toward the fistula, toward which it extends, but stops short of reaching (Fig.

5645). When the split vaginovesical wall has been opened up to the extent which the splitting makes possible, the vesical aspect of the fistulous margins is closed by an anteroposteriorly running tier of non-penetrating sutures (Fig. 5646, **a**) – after which the bed of the vaginal aspect of the wound is closed by a second tier of sutures which enter the vaginal mucosa and emerge

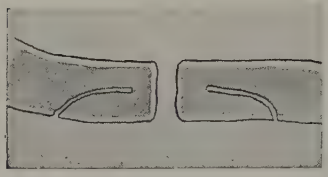


Fig. 5645.—Operation for Vesicovaginal Fistula by Inward Flap Splitting from an Outlying, Circumscribing Parafistulous Incision – I; – The common vaginovesical wall is split, not from the margins of the fistula outward, but inward, from the vaginal surface toward, but not into, the wall of the fistula.

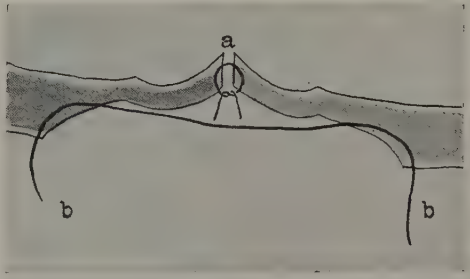


Fig. 5646.—The Same – II: – **a**, Buried, subvesicular suture; – **b**, **b**, vaginal suture (which should include more tissue).

through the raw bed in the neighborhood of the buried suture (and close enough to it to prevent the formation of pockets in which hematomata may take place) (v. Fig. 5646, **b**, **b**). A sectional view of the technic is seen in Fig. 5647. The method provides considerable extent of raw surface for union – but, necessarily, requires considerable redundancy of tissue for its applica-

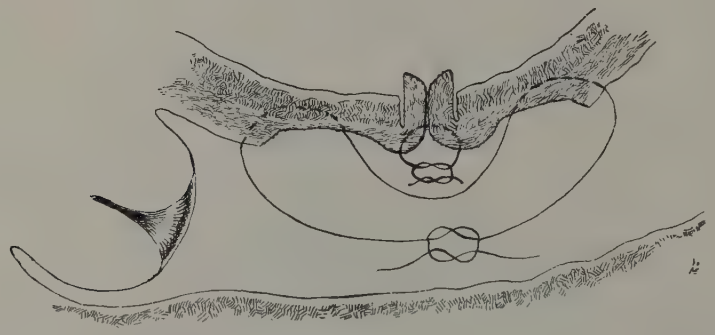


Fig. 5647.—The Same – III; – Sectional view of the operation. The circular flap has been cut from its position and split part way toward the fistula, into which it is inverted, thus approximating raw surfaces. The base of the inverted circular flap is sutured by buried stitches – and the denuded vaginal wall is brought together by sutures placed in the manner shown.

tion (as, conceivably, might be present where a fistula and cystocele might coexist).

Operation for Extensive Vesicovaginal Fistula by the Mobilization of the Bladder Posteriorly and Its Attachment to the Denuded Wall of the Vagina Anteriorly – Kelly's Operation.—This method has been successfully applied to large fistulæ, especially such as are apt to result after one or more failures following the more usually applied procedures. A marginal incision is made through the free border of the posterior two-thirds of the

fistula (Fig. 5648). Through this incision, by combined sharp and blunt dissection, the bladder wall is separated from the vaginal wall – and from the cervix uteri, and on up to the peritoneal reflection, if separation that high be necessary. The vaginal aspect of the anterior one-third of the margin of the fistula is pared – down to, but not including, the vesical, or vesico-urethral mucosa. Ureteral catheters having been carried into the ureters, to safeguard the ureters during suturing, the mobilized posterior bladder wall is now brought forward and its freshened edge sutured with fine silkworm filament, to the vaginal aspect of the denuded, but non-mobilized, anterior one-

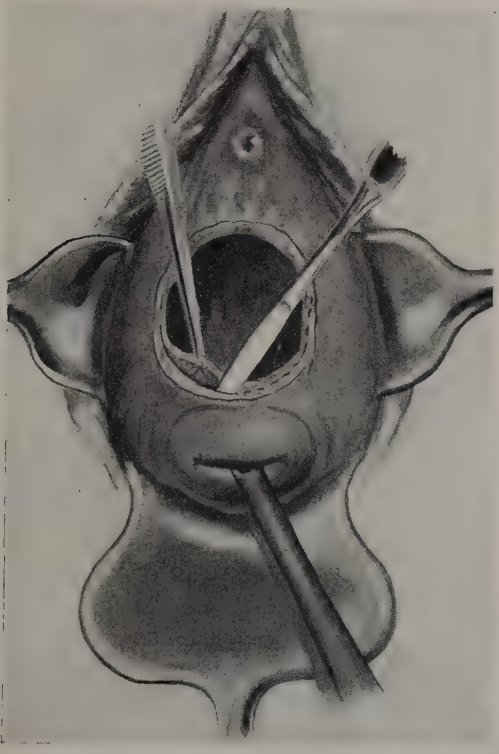


Fig. 5648.—Operation for Extensive Vesicovaginal Fistula by the Mobilization of the Bladder Posteriorly and Its Attachment to the Denuded Wall of the Vagina Anteriorly – Kelly's Operation – I; – The mobilization of the posterior two-thirds of the bladder margin – and the denudation of the vaginal aspect of the anterior third of the fistulous opening.

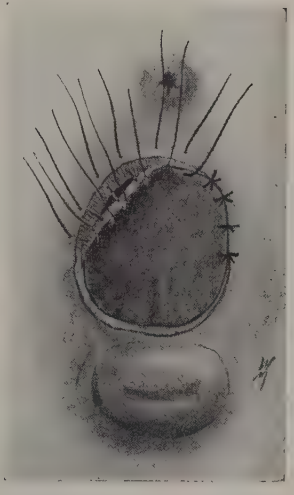


Fig. 5649.—The Same – II; – The bladder wall, detached posteriorly, is drawn forward and sutured to the anterolateral rim of the fistula by sutures not penetrating the cavity of the bladder.

third of the fistulous margin (Fig. 5649) the sutures so passing through the under surface of the vesical muscularis as to direct its margin upward into the reconstructed bladder. The previously placed ureteral catheters direct the orifices of the ureters upward, out of the way of suture compression. No attempt is made to close the vaginal wound, which is allowed to granulate and cicatrize. The ureteral catheters are retained in position for three days.

Operation for Extensive Vesicovaginal Fistula by Mobilizing the Posterior Bladder Wall from the Vagina and Uterus, and Suturing It to the Anterior Vesical Wall – Mackenrodt Operation.—The freeing of the

posterior wall of the bladder, so that it may be brought forward into the gap, is the essential feature in this method of operating – and is the application of a most important principle in dealing with fistulæ of such size, or involved by

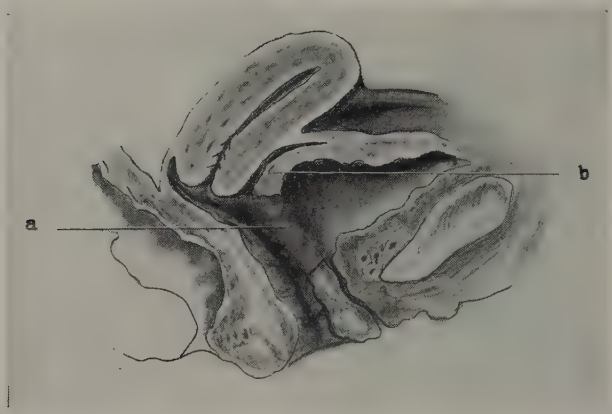


Fig. 5650.—Operation for Extensive Vesicovaginal Fistula by Mobilizing the Posterior Bladder Wall from the Vagina and Uterus, and Suturing It to the Anterior Vesical Wall – Mackenrodt – I; – a, Large fistulous opening, at the base of the bladder, into the vagina; – b, area of posterior bladder wall separated from the vagina and uterus by blunt dissection, in the plane of the vesicouterine septum.

such cicatricial tissue, as to make closure of the opening otherwise either very difficult, or impossible. With the posterior vaginal wall retracted, the cervix uteri, posteriorly, and the superior vaginal wall, opposite the urethral prominence, anteriorly, are grasped with volsellæ and drawn in opposite directions.

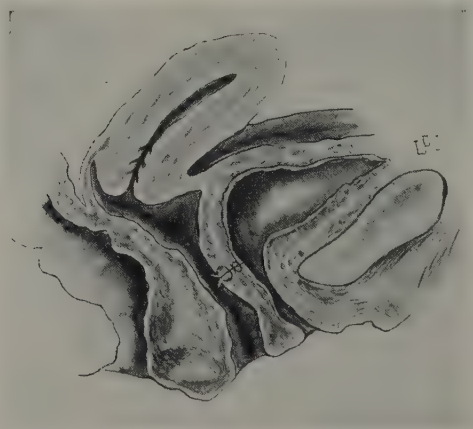


Fig. 5651.—The Same – II; – The detached posterior bladder wall is brought forward and sutured anteriorly to the anterior bladder wall, near the urethral orifice, by two tiers of sutures – the deeper, not penetrating the bladder, and the more superficial abutting upon the vagina.

While thus held, the anterior vaginal wall is incised in the median line, from over the urethra, backward to the cervix, passing through the fistula. The margins of the fistula are now split, thereby separating the bladder from the vagina, carrying the separation of the two viscera even as far as the vesico-

uterine peritoneal fold, if necessary, and as widely as need be, to thoroughly mobilize the base of the bladder. The posterior bladder wall must be free enough to enable the margins of the fistula to be approximated without tension, either anteroposteriorly or laterally, as seems best. The margins of the fistulous opening are then denuded with forceps and sharp scissors. The parts, at this stage, present the appearance shown in Fig. 5650. The margins of the fistula are next brought together, first, by a non-penetrating tier of chromic catgut sutures, and next, by a tier of vaginal stitches of silkworm filament (Fig. 5651).

If the vaginal margins cannot be brought together after closing the vesical aspect of the wound, the body of the uterus may be drawn forward, as in the

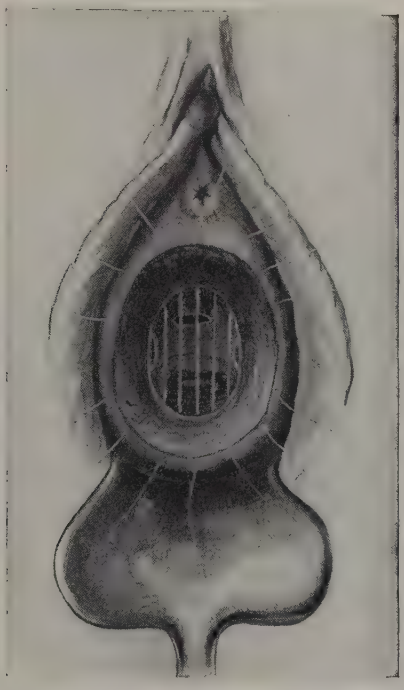


Fig. 5652.—Colpocleisis for Large or Complicated Vesicovaginal Fistula;—The circular band of vaginal denudation is seen, anterior to the site of the fistula, which is shown above the cervix uteri. Interrupted sutures are so placed as to approximate the anterior and posterior vaginal walls in a transverse direction.

interposition operation for prolapse (v. Index) and sutured to the vaginal margins, thereby fastening the uterus in anteflexion—thus utilizing the uterus to fill in the gap, as a base for the site of the fistula.

Operation for Vesicovaginal Fistula by the Transvesical Route—Trendelenburg's Operation.—The bladder is opened by a median, suprapubic incision, and its wall temporarily sutured to the skin. An Assistant passes his first two fingers into the vagina and raises the floor of the vaginal well into the bladder—bringing it nearer the suprapubic wound, and, at the same time, everting the margins of the vesical aspect of the fistula. With the bladder cavity well illuminated, and by means of slender, long-handled instruments, the easily elevated fistulous tract is cureted, and its vesical aspect

denuded – after which the vesical end of the fistula is closed by chromic catgut stitches. The bladder is closed, and the suprapubic wound temporarily drained. The patient is then placed in the lithotomy posture, and the vaginnl end of the fistula similarly cureted, denuded, and sutured. A retentioa catheter is temporarily worn.

Operation for Extensive or Complicated Vesicovaginal Fistula by Colpocleisis.—Closure of the vagina and the conversion of the vagina and bladder into a common receptacle for urine and uterine discharge is to be considered as a last resort in the treatment of unusual types of vesicovaginal and vesico-utero-vaginal fistulæ, not correctable by other methods. The manner of obliterating the vaginal passage has been already described (v. Index). This obliteration of the vaginal outlet is accomplished by denuding a circular, band-like area of vaginal wall (Fig. 5652) – the band being from 2 to 3 cm. (13/16 to $1\frac{3}{16}$ inches) in width, passing in front upon the anterior vaginal wall, immediately below the fistula, and behind upon the posterior vaginal wall, as high as possible. The anterior half-circle of this denuded band of tissue is then sutured to the posterior half-circle – which is the manner in which the anterior and posterior vaginal walls naturally approximate themselves.

Fig. 5653.—Vesico-uterine Fistula – The fistula here is through a somewhat higher part of the uterine wall than usual.

Episiorrhaphy, or the closure of the vagina by suturing together the labia majora, is sometimes performed in cases where the fistula is situated very low down.

(2) **Vesico-uterine Fistulæ, in General.**—In vesico-uterine fistulæ (Fig. 5653), the communication is between the bladder and the uterine cavity – the urine then emptying itself into the vagina through the normal cervical canal. Their cause is usually a former tear during confinement, extending through the cervix and into the bladder, after which the lower or cervical aspect of the wound heals, leaving a fistulous tract between the bladder and cervical canal, through some part of the cervical portion of the uterus – as, for anatomic reasons, fistulæ between the bladder and uterus can only involve the cervical portion of the latter – unless the vesico-uterine peritoneal pouch be sealed by adhesions. In Fig. 5654 a combined vesico-uterine and vesico-utero-vaginal is shown.

Operation for Vesico-uterine Fistula by Denudation and Suturing Through the Temporarily Split Cervical Lips.—The position and relations of a vesico-uterine fistula have been explained (v. Fig. 5654). The cervix is

split upon one or upon both sides _ and the two cervical lips drawn apart, exposing the cervical opening of the fistula (Fig. 5655). The margins of the fistula are pared, the course of the tract cureted, and the cervical aspect of the fistulous tract closed by chromic catgut stitches, which pass deeply into the cervical tissues, so as to approximate the opposite walls of the fistula for an appreciable part of its extent. The split lips of the cervix are then closed exactly as in bilateral trachelorrhaphy (v. p. 264).

Operation for Vesico-uterine Fistula by Exposing and Suturing the Vesical and Uterine Aspects of the Fistula Through the Temporarily,

Fig. 5654.—Vesico-uterine and Vesico-utero-vaginal Fistula: _ **a,** Bladder; _ **b,** uterus; _ **c,** vagina; _ **d, e,** course of fistula, extending either between bladder and uterus only, or between bladder, vagina, and uterus.

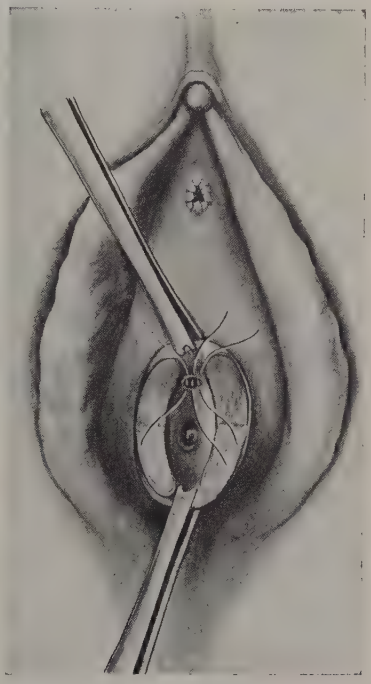


Fig. 5655.—Operation Upon Vesico-uterine Fistula by Temporarily Splitting the Cervix and Denuding and Suturing the Fistula; _ The cervix has been split laterally and the two halves drawn apart _ exposing the fistula in the anterior wall. Sutures are placed through the walls of the freshened fistula, anteroposteriorly, or laterally, as indicated _ and the split lips sutured, as in trachelorrhaphy.

Transversely Divided Anterior Vaginal Fornix _ Champney's Operation.— The cervix is brought down with volsellum forceps and a transverse incision of about 7.5 cm. (3 inches), made through the anterior vaginal fornix (Fig. 5656) and, through this, by combined sharp and blunt dissection in the vesico-uterine plane, the bladder is separated from the uterus, up to and beyond the fistulous tract. This separation will cross the course of the fistula, dividing it into uterine and vesical parts. The wall of each half of the fistula is cureted _ after which the vesical end is first closed by non-penetrating sutures of chromic catgut (Fig. 5657) _ and then the uterine end is closed by deeply placed sutures, which compress the walls of this thicker part of the tract as

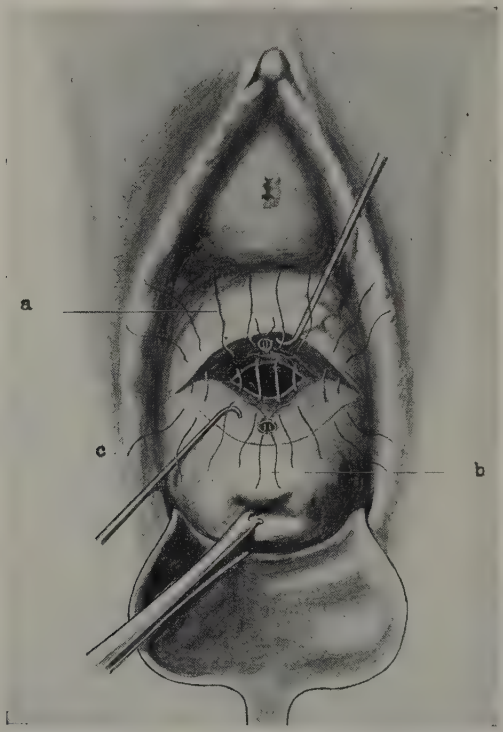


Fig. 5656.—Operation for Vesico-uterine Fistula by Exposing and Suturing the Vesical and Uterine Aspects of the Fistula Through the Temporarily, Transversely Divided Anterior Fornix _ I _ Champney's Operation; _ The bladder opening is exposed through a transverse vaginal incision in the anterior fornix _ through which the bladder is dissected from and above the cervix, in the uterovesical plane _ exposing the vesical and cervical openings: _ a, Non-penetrating, buried sutures closing the bladder opening; _ b, sutures closing the cervical fistula; _ c, some of the sutures closing the main wound.

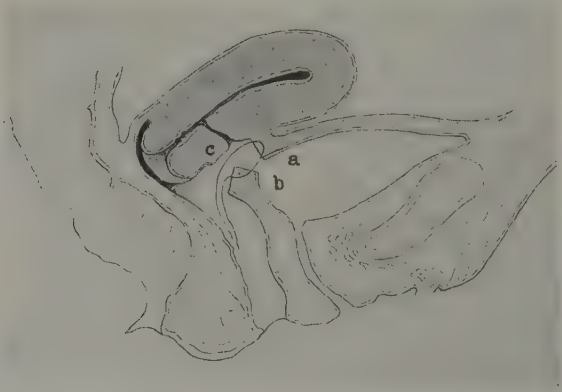


Fig. 5657.—The Same _ II; _ Sectional view; _ The bladder is freed from the uterus. The margins of the bladder opening are then united by non-penetrating sutures spanning the freshened edges of the fistula, a to b. Finally, the incision in the vaginal fornix is sutured. c, The uterine portion of the fistula will, then, often close under simple curetage.

far as possible. Finally, the opening in the anterior vaginal fornix is closed _ and a catheter retained in the bladder.

Operation for Vesico-uterine Fistuia After Mobilization of the Posterior Bladder Wall – Mackenrodt's Technic.—This, which may be regarded

Fig. 5658.—Suprapubic, Transperitoneal Operation for Vesico-uterine Fistula – I; – a, Clamp, drawing one lip of the incised vesico-uterine fold of peritoneum toward the bladder; – b, clamp drawing the other lip toward the uterus. In the separated connective-tissue plane are seen the vesical and uterine openings of the fistula. Sutures will be placed to close each fistulous opening separately

as a more extensive application of the immediately preceding method, has been described in connection with vesicovaginal fistulæ (v. p. 342) – and will be again referred to in connection with vesico-utero-vaginal fistulæ (v. p. 355).

Fig. 5659.—The Same – II; – Sectional view: – a, Division of the vesico-uterine peritoneal reflection, thus freeing the bladder and uterus from each other, and exposing the site of the fistula in each; – e, the subperitoneal intervesico-uterine space. The lines for denuding the vesical opening are seen.

Operation for Vesico-uterine Fistula Through Abdominal Section.—The approach is through an infra-umbilical, median abdominal section. The fundus of the uterus is grasped by uterine-holding forceps and retracted upward and backward, while the bladder is displaced forward. A transverse incision

is then made across the floor of the vesico-uterine reflection of peritoneum, and the margins of the incised peritoneum caught by forceps and retracted – and, while thus held, the bladder and uterus are separated, until the fistulous tract

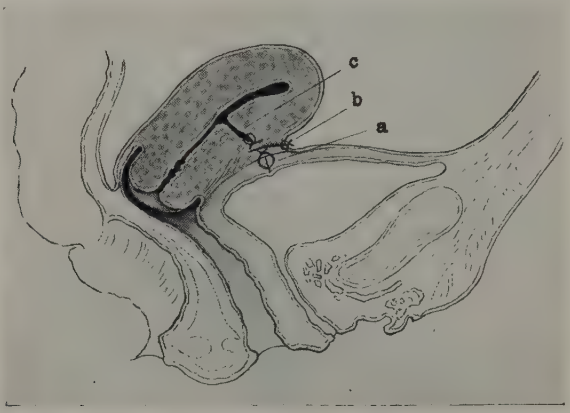


Fig. 5660.—The Same – III; – The parts sutured: – a, Suture of the vesical fistula; – b, suture of the vesico-uterine peritoneal reflection; – c, uterine fistula, of which the end opening into the bladder is closed, after freshening, by suture – the rest of its cureted tract being left to close by granulation.

is crossed, and both of its artificially made vesical and uterine ends are exposed (Fig. 5658). The sectional view of the parts is shown in Fig. 5659. Each end of the fistulous tract, after being cureted, is closed by buried stitches

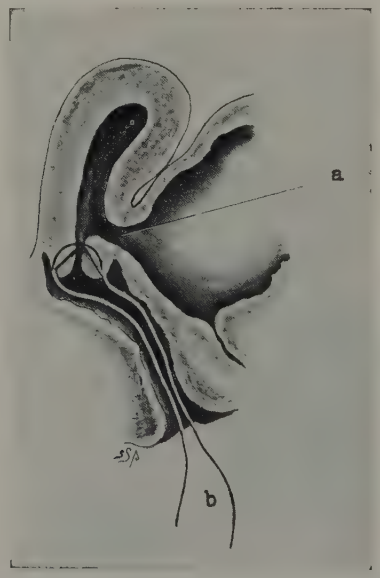


Fig. 5661.—Hysterostomatocleisis for Vesico-uterine Fistula: – a, Site of fistula; – b, one of sutures uniting cervical walls, after excision of the cervical lips as indicated by the dotted lines

of chromic catgut – and the margins of the divided peritoneum are sutured – the completed operation being as seen in Fig. 5660. Finally, the abdominal wall is closed in the usual manner.

Operation for Vesico-uterine Fistula by Hysterostomatocleisis.—Closure of the cervical canal and the conversion of the vesical and uterine cavities into one common receptacle (Fig. 5661) may be regarded as a last resort. It is usually accomplished by excising a wedge-shaped piece of the presenting portion of the cervix, so planned as to furnish anterior and posterior lips – which are then sutured together, very much in the same manner as in trachelorrhaphy.

Fig. 5662.—Operation for Vesico-utero-vaginal Fistula by Intervesicocervical Exposure Followed by Closure of the Vesical Opening and Excision and Closure of All or Part of the Cervical Tract – I; – The lines of incision.

(3) **Vesico-utero-vaginal Fistulæ, in General.**—In this type of fistula, sometimes called cervico-vesico-vaginal fistula (or somewhat ambiguously, juxtacervical fistula) the communication is between the bladder and vagina, through the intervesico-uterine connective-tissue plane, or between the bladder and partly destroyed cervix, or through some part of the cervical tissue (v. Fig. 5662). These fistulæ lie in the vaginal vault, in some portion of

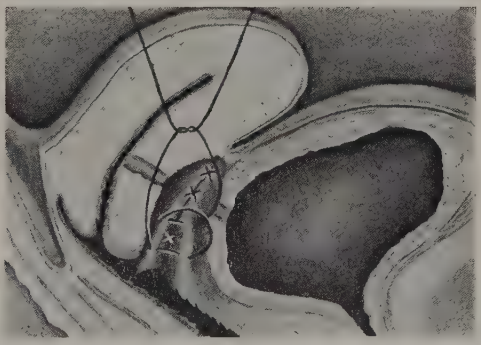


Fig. 5663.—The Same – II; – Through the triangular incision of exposure the isolated margins of the fistulous openings into the bladder and uterus will be closed by a double tier of non-penetrating sutures – and over this site of suturing the vaginal incision will be closed (the latter sutures alone being here shown).

the anterior vaginal fornix, or its lateral aspects, near to the cervix – some portion or all of the anterior lip of which has usually been destroyed, as a result of sloughing (pressure necrosis of the anterior lip from the child's head), or by the traumatism of laceration, or of forceps.

Operation for Vesico-utero-vaginal Fistula by Simple Denudation and Suture.—The exposed fistula is well cureted – or, if indicated, the

vaginal aspect of its wall may be pared, the funnel-shaped paring extending into the fistula – after which the opposite walls are brought together by fine chromic catgut stitches, which pass deeply enough into the tissues (avoiding the bladder) to compress some depth of the fistulous tract.

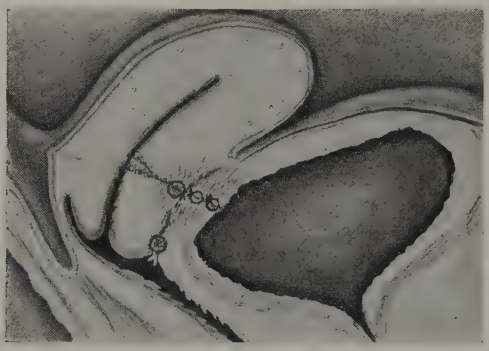


Fig. 5664.—The Same – III; – The sutured incisions of the vesical and uterine portions of the fistula and of the dome of the anterior fornix.

Operation for Vesico-utero-vaginal Fistula by Intervesicocervical Exposure, Followed by Closure of the Vesical Opening and Excision

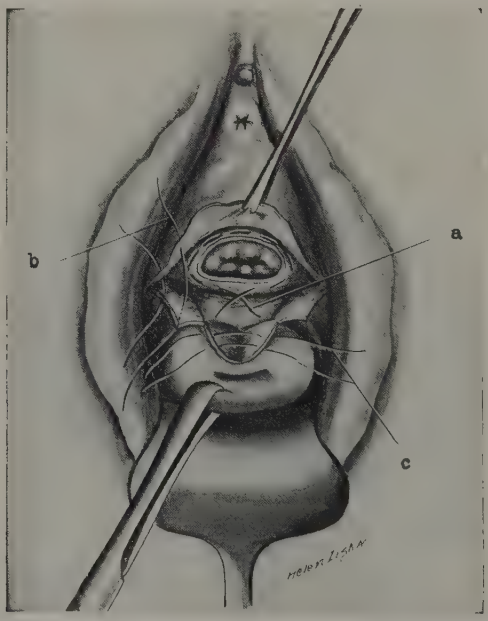


Fig. 5665.—Operation for Vesico-utero-vaginal Fistula by Separating Bladder and Cervix and Inverting the Fistulous Opening; – The vesicovaginal fistula is pared – semi-elliptic flaps are dissected back, a – and a non-penetrating, buried suture placed through the margin of the bladder opening – and marginal sutures, b, in the flaps. The cervical portion of the fistula is excised in wedge-fashion, and interrupted sutures, c, placed to approximate the surfaces.

and Closure of the Cervical Tract.—The cervix is drawn down with vol-sellum forceps, and the site of the fistulous opening and tract exposed by a transversely placed incision as shown in Fig. 5662. The general feature of the

transversely extended incision is to enable two flaps to be temporarily turned aside, and the site of the bladder opening exposed in the intervesicocervical plane _ and to excise the fistulous trough, which may have healed, which passes down the face of the cervix. The bladder and cervix are separated from each other by combined blunt and scissor dissection, until the bladder opening of the fistula and the cervical tract, or boundary, of the fistula be exposed. The vesical opening is then closed by non-penetrating chromic catgut stitches _ and the margins of the cervical portion of the fistulous tract are excised, and the resulting walls brought together by the same kind of suturing (Fig. 5663). Finally, the margins of the flaps made in the anterior vaginal fornix are closed (Fig. 5664). The chief difficulty in dealing with this class of fistulæ is the presence of scar tissue and relatively unyielding cervical tissue, with which the patch-work of repair is to be made _ as compared with the more pliable and available tissues usually present in vesicovaginal fistulæ.

Fig. 5666.—Operation for Vesico-cervico-vaginal Fistula by Mobilizing the Uterus from the Bladder, Followed by Closure of the Vesical Opening of the Fistula and Reattachment of the Cervix to the Vaginal Vault _ Woelfler's Technic.

Operation for Vesico-utero-vaginal Fistula by Separation of Bladder and Cervix and Inversion of the Vesical Fistulous Opening.—In cases where nothing more than a mere dimpling or depression in the cervicovaginal vault marks the outlet of the fistula, without burrowing, or furrowing the anterior lip of the cervix, the connective-tissue plane between the bladder and cervix may be opened up, and the fistulous tract and openings well exposed, by the type of incision shown in Fig. 5665, **a** _ after which the margins of the vesical opening are inverted, by suture, into the bladder, reinforced by a second tier of sutures _ and the triangular wound in the vaginal fornix closed (Fig. 5665, **b**).

Operation for Vesico-utero-vaginal Fistula by Mobilization of the Uterus from the Bladder, Followed by Closure of the Vesical Opening of the Fistula and Reattachment of the Cervix to the Vaginal Vault _ Woelfler's Technic.—The cervix is seized with volsellum forceps, and, while

held downward, the plane between the bladder and cervix is opened by a transverse incision in the vaginal fornix – and, through this opening, the bladder is separated from the cervix – the separation extending upward con-

Fig. 5667.—Vesico-utero-vaginal and Vesicovaginal Fistulæ Coexisting.

siderably above the fistulous tract. Both the vesical and cervicovaginal aspects of the fistula are cureted, and the vesical portion may be excised, after which the vesical part of the tract is closed by non-penetrating chromic catgut sutures.

Fig. 5668.—Operation for Vesico-utero-vaginal Fistula by Approximation of the Anterior Half-circumference of the Denuded Vesical Opening to the Denuded Posterior Cervical Lip, Thereby Converting Uterine and Vesical Cavities Into One.

This suturing may be in one or in two layers. Finally the anterior lip of the cervix is again attached to the vault of the vaginal fornix by suture. The technic is indicated in Fig. 5666. When the vesical end of the fistula is closed,

and the urinary flow cut off, the rest of the tract, even when it passes through the substance of uterus, or cervix, usually closes spontaneously – or may be cureted and sutured.

Operation for Combined Vesico-uterine and Vesico-utero-vaginal Fistula After Mobilization of the Posterior Bladder Wall – Mackenrodt's Technic.—This method of procedure is applicable to either a vesico-uterine or vesico-utero-vaginal fistula, or to the combination of the two (Fig. 5667). The method has been alluded to in connection with vesico-uterine fistulæ (v. p. 349) – and the technic has been described among the operations for vesicovaginal fistulæ (v. pp. 342, 343). The uterine portion of the fistula is usually onlycureted, and is then allowed to close by granulation – or may, in addition, be sutured.

Operation for Vesico-utero-vaginal Fistula by Approximation of the Denuded Anterior Cervical Lip to the Site of the Fistula.—In some instances, especially in the larger types of this variety of fistula, the margins of the anterior lip of the cervix are denuded, and approximated, by suture, to the denuded margins of the vaginal aspect of the vesical opening. All tension must be relieved before undertaking to suture the parts – whether it involve some degree of separation between the cervix and bladder, or bilateral splitting of the cervix, so that, by either of these technics, the anterior cervical lip can be drawn sufficiently forward for easy approximation.

Operation for Vesico-utero-vaginal Fistula by Approximation of the Anterior Half-circumference of the Denuded Vesical Opening to the Denuded Posterior Cervical Lip, Thereby Converting Uterine and Vesical Cavities Into One.—In cases where the anterior cervical lip has been destroyed in the process connected with the fistula, the denuded posterior lip of the cervix is sometimes sutured to the denuded half-circumference of the anterior aspect of the bladder opening, thereby converting the bladder and the cavity of the uterus into one common receptacle (Fig. 5668). Naturally, such a procedure as this should be a last resort.

C. OPERATIONS FOR FISTULÆ INTERCOMMUNICATING BETWEEN THE FEMALE GENERATIVE ORGANS AND THE URETHRA

(1) **Urethrovaginal Fistulæ, in General.**—This form of fistula is usually the result of the pressure of the child's head, or of instruments, at childbirth – the pressure catching the urethra between the object of compression and the symphic bones. The lower wall of the urethra usually suffers – resulting in a simple urethrovaginal fistula. More frequently, however, the damage results in partial destruction of the vesical, urethral, and vaginal walls – constituting a vesico-urethro-vaginal fistula. Sometimes the traumatism results in separate vesicovaginal and urethrovaginal fistulæ combined.

Operation for Urethrovaginal Fistula by Inverted Lateral and Superimposed Vaginal Flaps.—A posterior vaginal retractor is inserted, the vaginal lips retracted laterally, and a sound introduced through the urethra into the bladder. Two lateral rectangular flaps, hinging medially and free externally, are outlined upon the vaginal wall – so planned, that when freed and inverted, they will meet in the median line without tension, and, at the same time, retain sufficient attachment not to be torn from the margins of the fistula (Fig. 5669).

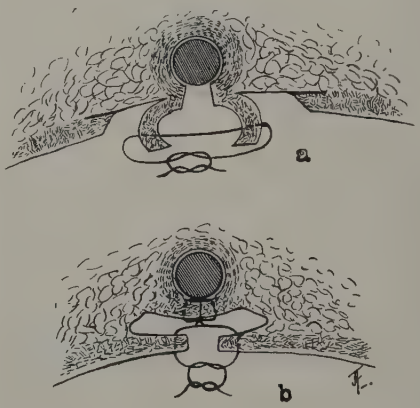
These two flaps are incised at their ends and outer sides, mobilized in the connective-tissue plane, turned inward, and their lateral borders, formerly outward, are sutured together in the median line – thereby roofing over the fistulous opening with its contained sound. The mobilization of these flaps, together with the placed suturing, is seen in Fig. 5670, **a** – and the same flaps,

when the suturing is tied, in Fig. 5671, **b**. The line of interrupted sutures which unite these inverted flaps in the median line completely shut off the fistulous opening – their mucosal surface forming the new floor of the urethra.

The raw surfaces of these flaps are now, in turn, covered by mobilizing (undercutting) the raw vaginal margins, left by raising the two original flaps which were inverted (v. Fig. 5670, **a**, where the undercutting of these covering flaps is shown). The margins of these mobilized flaps – each being glided mediad, over the inverted flaps – are sutured together in the median line, over the inverted flaps – thus giving a double flap reinforcement over the defect (v. Fig. 5671, **b**). Guard against hematoma beneath the flaps.

The inverted flaps are sutured together by buried sutures of fine chromic catgut, and the covering flaps with the same (or with silk). This method is applicable especially to larger fistulæ.

Fig. 5669.—Operation for Urethrovaginal Fistula by Inverted Lateral and Superimposed Flaps – I; – A sound having been introduced into the urethra, two rectangular flaps are laid out, attached internally and free externally.



Figs. 5670 and 5671.—The Same – II and III: – a, The previously outlined flaps of mucosa are incised into the connective-tissue plane – and are then inverted into the fistulous opening, mucous surface inward The vaginal wall adjacent to the site from which the flaps are raised is undercut for mobilization. The urethral sound is seen in cross-section; – b, the urethra is shown reconstructed – and the covering flaps of adjacent vaginal wall are being drawn over the inverted flaps, raw surface to raw surface, to reinforce the site.

Operation for Urethrovaginal Fistula by Denudation and Suturing.—In cases of minor involvement it will sometimes happen that a small fistula of this type may be successfully treated by cureting its tract and then suturing its vaginal outlet by deeply placed sutures approximating some extent of its canal, but not penetrating the bladder, or the same technic may be applied as in Sims' operation for vesicovaginal fistula (v. p. 325).

(2) **Urethro-vesico-vaginal Fistulæ, in General.**—The destructive force which may produce a urethrovaginal fistula may, at the same time, produce an accompanying vesicovaginal fistula (v. p. 316).

Operation for Associated Urethrovaginal and Vesicovaginal Fistulæ with Retention of Sphincteric Actlon – Kelly's Technic.—This special method of operating was applied by Kelly to a case in which there coexisted

a urethrovaginal fistula just distal to the sphincter of the vesical outlet, and a vesicovaginal fistula just proximal to it (Fig. 5672) in which it was particularly indicated to save the sphincteric action. The intervening bridge of sound tissue was so narrow that it was not disturbed or utilized in any way.

Fig. 5672.—Operation for Combined Vesicovaginal and Urethrovaginal Fistulæ. I; The dotted lines show the areas to be excised. (Figs. 5672 and 5673 modified from Kelly.)

but simply "undercircuited," as it were. An oval denudation, in the axis of the vagina was made, so planned as to throw both fistulous outlets into one, denuding the posterior aspect of the vesicovaginal fistula and the anterior

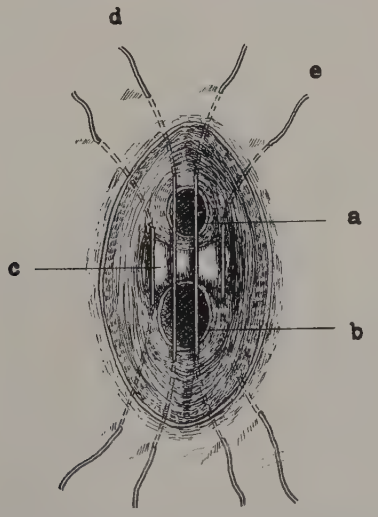


Fig. 5673.—The Same. II: a, Urethral fistula; b, vesical fistula; c, bridge of sound vesico-urethro-vaginal wall between the vesical and urethral fistulæ opening into the vagina; d, e, sutures closing walls of fistula below (beneath) the sound bridge of tissue.

aspect of the urethrovaginal fistula (without touching the bridge of tissue), by a broad bevel at the expense of the vaginal tissue of the anterior vaginal wall (Fig. 5673). The effect of dealing with a single large fistula was thus produced. The denudation was carried down to the vesical and urethral

mucosa as in operating upon vesicovaginal fistulæ by Sims' method. When this was accomplished the margins were brought together by interrupted sutures of silkworm filament, introduced in the axis of the vagina, and bringing

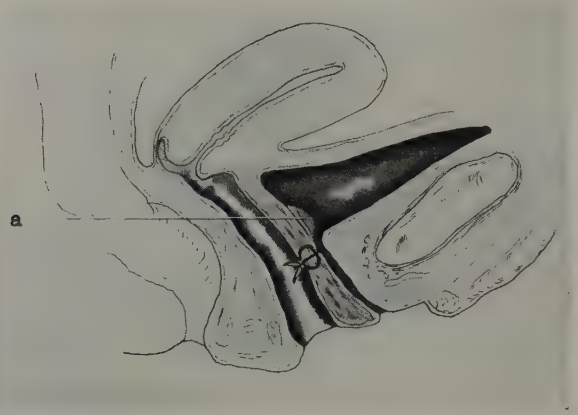


Fig. 5674.—The Same _ III; _ Following denudation of the vesicovaginal and urethrovaginal fistulæ, the anterior aspect of the former and the posterior aspect of the latter are sutured *beneath* the bridge, a, of intervening tissue at the neck of the bladder.

the parts together in a transverse cicatrix (Fig. 5674). Union was complete and full sphincter control resulted.

D. OPERATIONS FOR FISTULÆ INTERCOMMUNICATING BETWEEN THE FEMALE GENERATIVE ORGANS AND THE RECTUM

(1) **Rectovaginal Fistulæ, in General.**—These constitute, naturally, the most common type of fistulæ intervening between the rectum and the female organs _ and are, most frequently, the result of rupture of the vaginoperineal body from natural or instrumental causes during labor _ the traumatism healing in part, but leaving an unhealed aperture in some portion of its course. The majority of these fistulæ are situated posteriorly, forming rectovaginal fistulæ _ rather than more anteriorly, forming anorectal fistulæ. Some of these fistulæ follow non-obstetric operations _ or are caused by local pathologic conditions.

Rectoperineal fistulæ are described under Operations Upon the Anorectal Region (Vol. V, pp. 174–190).

Operation for Rectovaginal Fistula by Simple Curetment, Cauterization, and Temporary Flap Protection.—While it may be exceptional that such simple measures succeed, they may be worth trying, especially in cases of minor grade, before adopting more elaborate measures. The following technic has been successfully used by the Author: Through a speculum in the rectum, and guided by a finger in the vagina, a small curet was employed to remove the lining of the fistulous tract (Fig. 5675) _ which was then cauterized with pure carbolic acid. A limited fold of redundant mucosa, vaginal, on the one hand, and rectal on the other, was caught with forceps, just above the fistulous openings, and brought down by a single fine chromic catgut suture, upon a small curved needle, and anchored to the mucosa immediately below the fistulous openings (Fig. 5676) _ so as to serve as mechanical lids, or protectors, to minimize, if not entirely prevent (which latter seemed hardly likely) the inflow of rectal and vaginal fluids into the tract during the

few days the stitches remained in position, and until the raw, swollen walls of the fistula had united. Subsequently, milk, which could formerly be injected through the tract, as a test, from either direction, could be injected through it from neither direction. The tract remained solidified.

Fig. 5675.—Curetage of Rectovaginal Fistula with Temporary Flap Protection of Rectal and Vaginal Openings _ I; _ Curet in the act of scraping the walls of the fistula throughout

Operation for Rectovaginal Fistula by Freshening and Marginal Suturing, Reinforced by a Modified Form of Perineorrhaphy by Triangular Denudation _ Schauta's Technic.—The fistula itself and its imme-

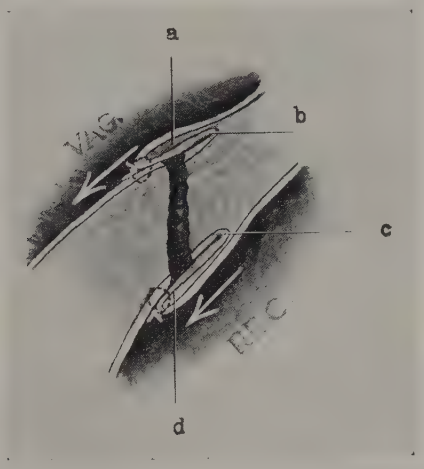


Fig. 5676.—The Same _ II; _ Cross-section of the vaginal, ab, and rectal, cd, flaps, drawn down from above and temporarily anchored below the openings of the fistula, to protect their orifices while their cureted tracts are granulating and adhering. The arrow shows the flow of vaginal and rectal fluids.

diate environemnt are exposed by the excision of a triangular piece of overlying mucosa (Fig. 5677). The fistulous walls are then cureted, or limitedly excised _ after which buried, non-penetrating, marginal sutures are

employed to bring the sides of the fistula together, without entering the rectum. A second tier of buried chromic sutures may be used. Finally, the margins of the triangular denudation are brought together by both vaginal and perineal sutures, very much after the fashion of a simple vaginoperineorrhaphy, thereby buttressing the site of the fistula.

Operation for Rectovaginal Fistula by Intravaginal and Intrarectal Suture of its Outlets Reinforced by a Modified Form of Perineorrhaphy by Flap Splitting.—The vaginoperineum is split, as in the ordinary operation of perineorrhaphy by flap splitting (v. p. 191). If the fistula be low

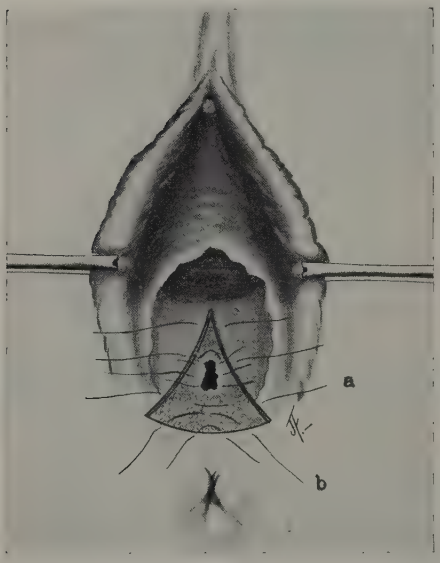


Fig. 5677.—Operation for Rectovaginal Fistula by Modified Vaginoperineorrhaphy After Suturing the Denuded Orifice – Schauta's Technic; – Non-penetrating, buried sutures are seen in the margin of the fistula: – a, Sutures closing the vaginal floor; – b, sutures closing the perineum.

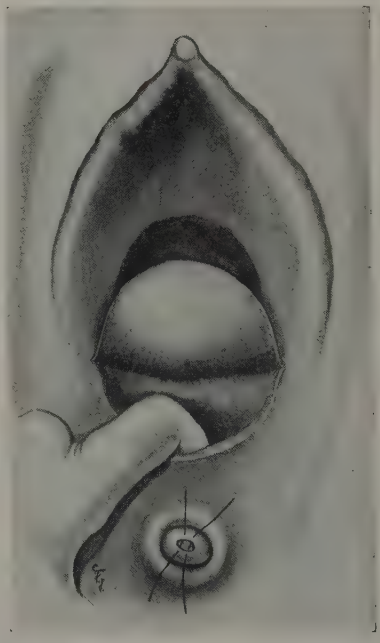


Fig. 5678.—Operation for Rectovaginal Fistula by Intravaginal and Intrarectal Suturing of Its Outlets, Reinforced by a Modified Form of Perineorrhaphy by Flap Splitting – Through the plane of dissection, made by raising the flap, the rectal aspect of the fistula everted into the anal orifice and sutured. The upper end of the fistula is then sutured from its vaginal aspect – after which the vaginoperineum will be sutured.

enough in the rectovaginal wall (and after it has been cureted), a finger introduced into the vaginal wound everts the rectal mucosa into the anal orifice, where its rectal end is closed by suture (Fig. 5678). The parts are then allowed to assume their normal relations, and the upper end of the fistula, lying in the dissected plane, is similarly closed by suture. The vaginoperineum is then closed as in the usual flap-splitting operation (v. s.) – thus buttressing the site of the fistula. If there appear to be any danger of making the fistula larger by the pressure of the finger in the act of everting it into the anal orifice, the upper end of the fistula, lying in the plane of dissection, may be sutured first, thereby strengthening it.

Operation for Rectovaginal Fistula by Parafistular Flap Splitting – Lauenstein's Operation.—The margins of the fistula are surrounded by an elliptic incision, the long axis of which corresponds with that of the vagina – and extends above and below the immediate site of the fistula (Fig. 5679). Through this the margins of the fistula are first pared – and then the vagino-rectal wall split in its connective-tissue plane (Fig. 5680). When the resulting flaps have been retracted laterally, the wall of the rectum, and its mucosa, pouting through the fistulous opening, are brought into the field (Fig. 5681). The margins of the rectal wall are then brought together – either by a non-penetrating purse-string suture of chromic catgut (Fig. 5681) – or by non-penetrating interrupted sutures (Fig. 5682). Finally, the margins of the vaginal flaps are sutured (as shown in the two preceding pictures).

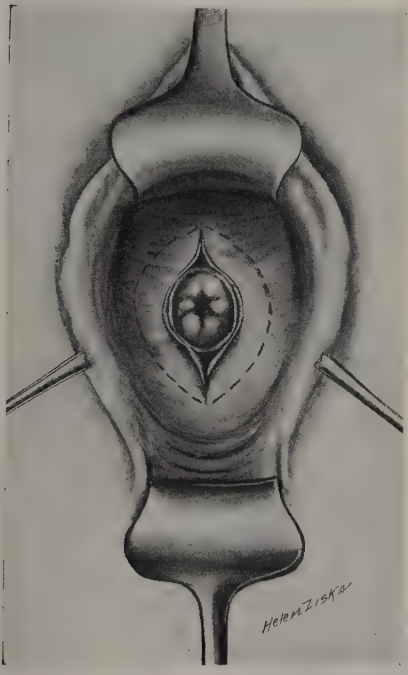


Fig. 5679.—Operation for Rectovaginal Fistula by Parafistular Flap Splitting – Lauenstein's Operation – I; – Making the elliptic incision and mobilizing the flaps.

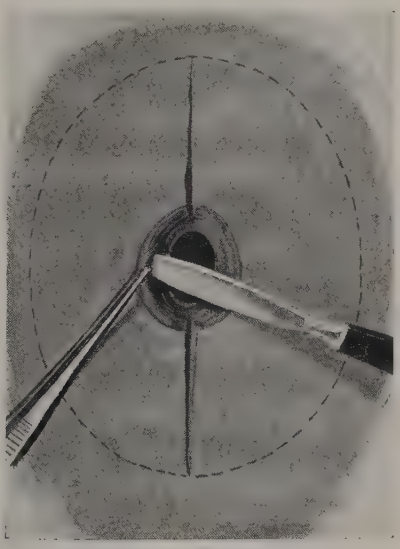


Fig. 5680.—The Same – II; – Splitting the vagino-rectal septum to form the vaginal flaps.

Operation for Rectovaginal Fistula by Crescent-shaped Excision of the Overlying Vaginal Mucosa, and the Covering of the Fistula by a Glided Flap – Le Dentu's Technic.—The vaginal opening of the fistula, together with the adjacent vaginal mucosa, is excised (through the mucosa only) in the manner shown in Fig. 5683. A finger is then introduced into the rectum, and the deeper, rectal portion of the fistulous tract made prominent – and, while thus held, and after curetment, or marginal excision, a buried, non-penetrating purse-string suture is placed around the opening of the fistula (Fig. 5684). Mattress-sutures are placed in the raw bed (carefully avoiding penetration of the bowel) – and these are then brought through the flap by a Reverdin needle after the flap is drawn upward – thereby approxi-

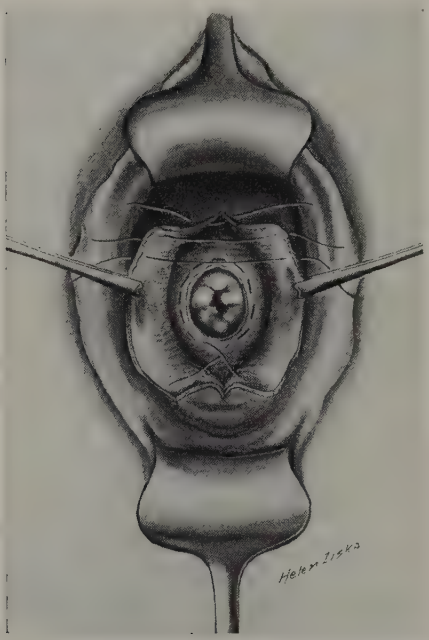


Fig. 5681.—The Same _ III; _ The rectal orifice of the fistula is being closed by non-penetrating purse-string sutures. Marginal stitches are in the retracted flaps.

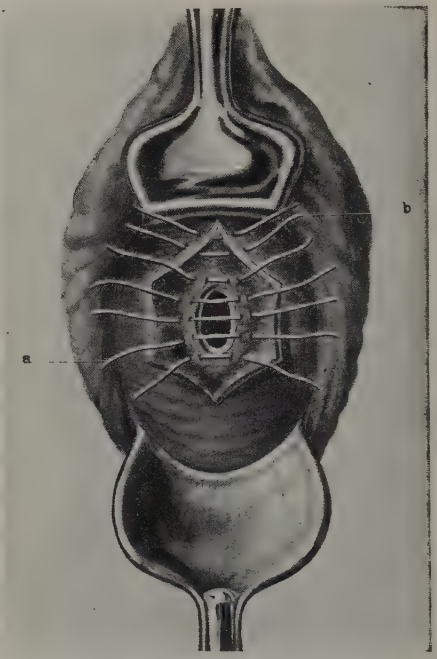


Fig. 5682.—The Same _ IV; _ The rectal orifice of the fistula is, here, being closed by non-penetrating interrupted stitches.

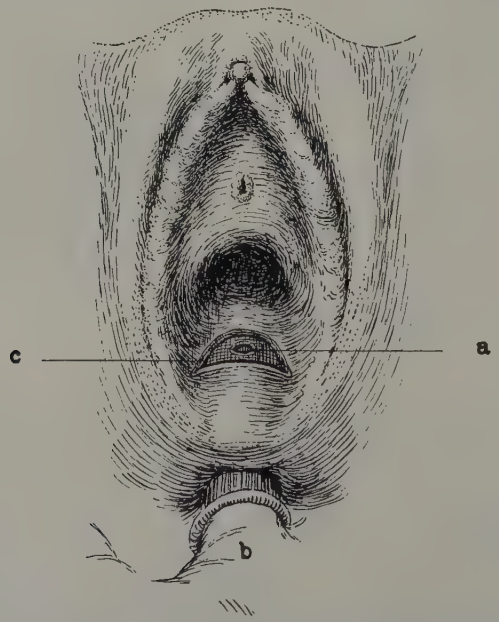


Fig. 5683.—Le Dentu's Operation for Rectovaginal Fistula by Crescent-shaped Excision of the Neighboring Mucosa and Sliding of Flap _ I: _ a, Fistula from rectum to vagina; _ b, gloved finger in rectum; _ c, crescent excision of vaginal mucosa only, including the mucous portion of the fistula.

mating, when tied, the flap to the underlying parts by a broad stretch of tissue – the pressure being increased by tying the mattress stitches over a small roll of gauze (Fig. 5685). If it seem better, the fistula itself may be closed by interrupted sutures of chromic catgut rather than by a purse-string suture. Marginal stitches are also employed.

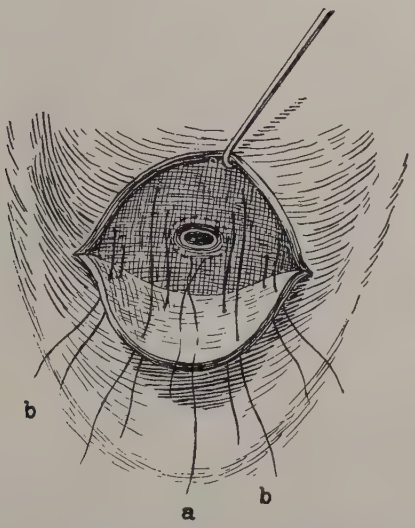


Fig. 5684.—The Same – II; – Approximating the flap: – a, Purse-string suture surrounding the fistula, without entering the rectal cavity; – b, b, mattress-sutures displacing upward and approximating the flap to the new site – to be finally followed by marginal sutures of the wound.

Operation for Rectovaginal Fistula by Complete Median Division of the Vaginorectal Wall and its Repair as for Complete Vagino-perineo-rectal Laceration.—This method is of especial application in those cases where the fistula is low down, near to, or within the area of sphincteric control. The common rectovaginal septum is medially divided, up to the fistula, after which the margins of the fistula are excised – and the parts are then repaired exactly as in operating for a complete laceration of the vaginal floor,

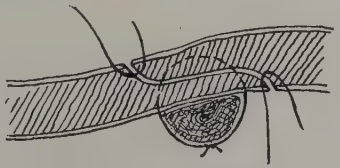


Fig. 5685.—The Same – III; – Tying the mattress-sutures over a roll of gauze, so as to produce broad snug compression of the flap against its bed. Marginal sutures are also used.

perineum, and rectum (v. p. 201). The sphincter ani is first put out of action by stretching – as in most operations for rectovaginal sphincter – so that, during convalescence there will be a free escape of feces, and no intrarectal pressure against the site of suturing.

Operation for Rectovaginal Fistula by Circumferential Excision of the Rectal Fistula-bearing Mucosa, and Denudation and Closure of the Vaginal Aspect of the Fistula – Marchand's Operation.—This procedure is applicable to some cases of fistula situated comparatively low down in the

rectovaginal septum — and the somewhat major technic would not, presumably, be applied except in types of fistulæ, especially larger or more complicated ones, or in those which had resisted simpler methods. The operation consists practically in the performance of a typical Whitehead technic for the removal of hemorrhoids (Vol. V, p. 158), insofar as getting rid, bodily, of the rectal aspect of the fistula. The anorectal mucosa is incised circularly, just within the anorectal orifice (Fig. 5686, **bd**) — after which, by combined sharp and blunt dissection, the rectal mucosa is freed from the whole circumference of the rest of the rectal wall — up to and sufficiently beyond the fistula (the freeing passing through the middle of the fistulous tract — **ab** and **cd**) to enable the fistula-bearing portion of the rectal mucosa to be drawn down and out of the rectum, until the portion bearing the rectal part of the fistula is down below the anorectal orifice (Fig. 5687). The detached rectal mucosa is then transversely divided, and its margins sutured to the mucocutaneous anorectal margins at the site of the original circular incision. The vaginal aspect of the fistula is freshened by curet, or pared by knife, and approximated by suture (v. Fig. 5687, **c**).

Fig. 5686.—Operation for Rectovaginal Fistula by Circumferential Excision of the Rectal Fistula-bearing Mucosa, and Denudation and Closure of the Vaginal Aspect of the Fistula — Marchand's Operation; — The fistula is seen in the rectovaginal wall. An extensive Whitehead operation (Vol. V, p. 158) is performed, freeing the rectal wall high up, along the lines **a**, **b** and **c**, **d**, and dividing the fistula midway between the vagina and rectum.

(2) **Vesicovaginal Rectal Fistula, in General.**—In rare instances traumatism during labor, especially in instrumental cases, such extensive damage is done, that large and complicated fistulæ result, involving the vagina and the bladder, on the one hand, and the vagina and the rectum upon the other. The partitions between these cavities may also be congenitally deficient. An illustration of such a condition is shown in Fig. 5688.

Operation for Vesico-vagino-rectal Fistula — von Grusden's Operation. —The object of this operation — which is here described in connection with the congenital deficiency of the septa between the vagina and bladder, and bladder and rectum, together with the absence of the urethra, is several fold — to close off the communication between the rectum and the common vesico-utero-vaginal cavity — to close the vaginal outlet — and to form a new urethral outlet by utilizing part of the urethral wall and its muscular sphincteric apparatus — the urethra then forming a common outlet for bladder, uterus, and vagina.

The steps of this complicated procedure are suggested in Figs. 5689–5692. Von Grusden modified Spinelli's operation of colpocleisis, consisting in the establishment of a rectovaginal fistula, when the constrictor muscles of the

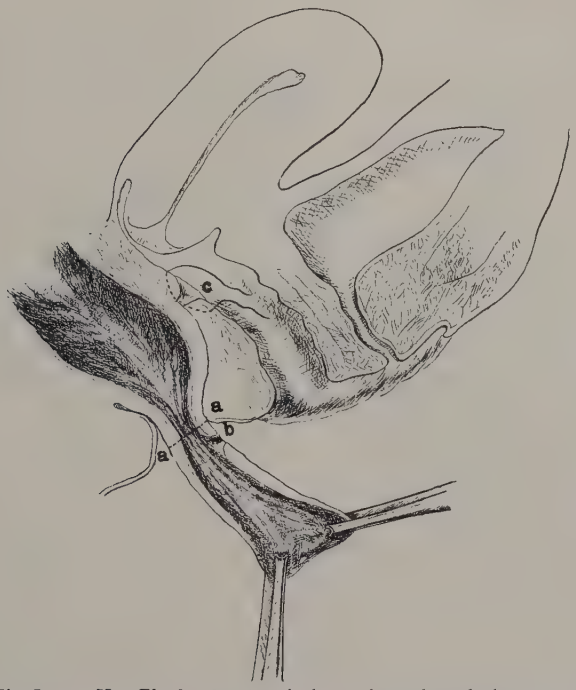


Fig. 5687.—The Same – II; – The freed rectum is drawn down through the anus and excised at a, a, proximally to the fistula, b, and then sutured to the anal mucosa. The vaginal aspect of the remnant of the fistula is freshened and closed by sutures, c.

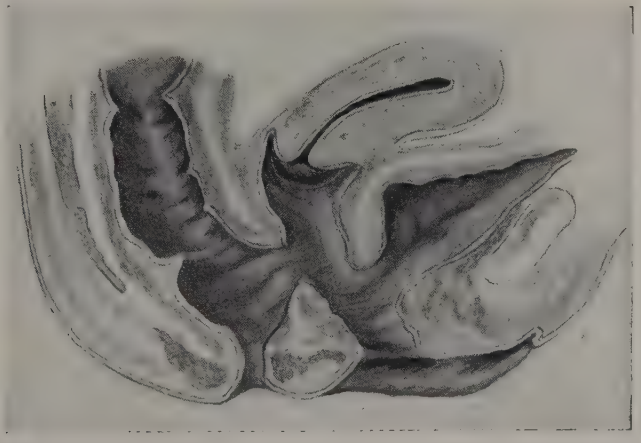


Fig. 5688.—Vesico-vagino-rectal Fistula – with congenital absence of urethra.

urethra and much of the bladder was destroyed – in this type of cases. In order to overcome the danger to which the patient was exposed, by fecal infection of the bladder and kidneys, in the Spinelli technic, Von Grusden,

adding to the Spinelli idea, undertook to construct an artificial urethra out of part of the rectal wall _ thus shutting off the rectum from the vesico-utero-vaginal tract _ by making, after dilating the anus, a canal from the recto-

Fig. 5689.—Von Grusden's Operation for Vesico-vagino-rectal Fistula _ I: _ a, Row of buried sutures closing the denuded vaginal wall; _ b, row of outside sutures in same; _ c, new urethral canal formed from folding of one-third of rectal wall adjacent to vaginorectal fistula; _ d, d, portion of new urethral sphincter corresponding with flap taken from one-third of rectum; _ e, e, anal sphincter of original two-thirds of rectum.

vaginal fistula to the perineum, its lower end being under control of the isolated part of the sphincter ani muscle, thereby affording continence of urine.

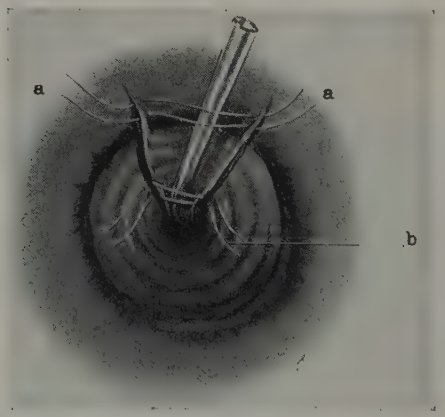


Fig. 5690.—Von Grusden's Operation for Vesico-vagino-rectal Fistula _ II; _ Common ano-rectal and vesico-vagino-rectal orifices, with glass tube in fistulous tract: _ a, a, Two of the stitches passing through entire thickness of rectal wall, to unite a one-third segment of the rectum, including the corresponding sphincters, around a tube to form a new urethra; _ b, two of the sutures uniting a two-thirds segment of the rectum with corresponding sphincter, to form a new rectal orifice.

Two axial incisions are made in the anterior wall of the rectum, so planned as to take in, or include, one-third of the circumference of the rectum between them _ these incisions extending from the skin of the perineum, upward around

both sides of the rectovaginal fistula (Fig. 5690) – to meet at a point between 2 and 3 cm. above it. The incisions pass through the mucous membrane, to the submucous layer, and divide the external sphincter ani muscle into two parts. The margins of the flaps are mobilized sufficiently to be approximated over a bent glass tube, placed in the fistula, and are secured by catgut sutures. These sutures are carefully placed, so as not to pass through the mucosa, into the lumen of the new urethra (Fig. 5691). The deeper parts of the flaps are approximated by another row of buried sutures.

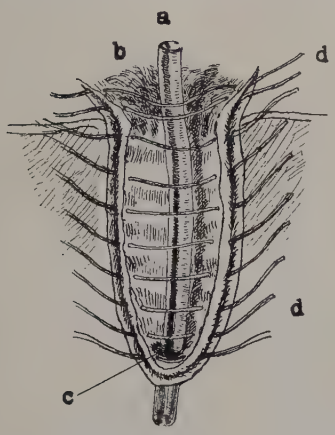


Fig. 5691.—The Same – III; – Mucous membrane view of the technic illustrated in Fig. 5690: – a, Glass or rubber tube passing through rectum, b, and entering rectovaginal fistula, c; – d, d, sutures uniting part of rectal wall to form new urethra.

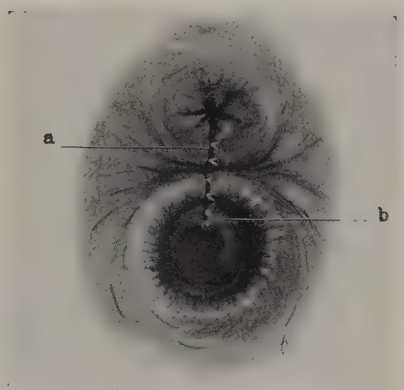


Fig. 5692.—The Same – IV; – Surface view of the sutures forming the new urethra, above, and the new rectum, below.

The rectal wall is then sutured together over the newly made urethra (Fig. 5692) – using especial care as to the deep sutures in the external sphincter. As a final result two separate sphincters – one for the anus – and one for the urethra – are created – as shown in Fig. 5692.

E. OPERATIONS FOR FISTULÆ INTERCOMMUNICATING BETWEEN THE FEMALE GENERATIVE ORGANS AND THE INTRAPERITONEAL PORTION OF THE INTESTINAL TRACT

(1) **Enterovaginal Fistulæ, in General.**—Fistulæ intercommunicating between the vagina and the intraperitoneal portions of the intestinal tract are rare. When present, the best method of operating upon them is via the transabdominal route – the abdomen being opened – the connection between the intestinal and genital tract divided – and the openings in each tract closed by suture.

CHAPTER LXXXIX

OPERATIONS UPON THE INTRAPERITONEAL FEMALE GENERATIVE ORGANS BY THE VAGINAL ROUTE

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SURGICAL ANATOMY OF THE INTRAPERITONEAL FEMALE GENERATIVE ORGANS

This is given on pp. 520 to 526.

COLPOPERITONEOTOMY, IN GENERAL

Colpoperitoneotomy, colpoceliotomy, vaginoperitoneotomy, or vaginoceliotomy _ all used synonomously _ are expressions signifying the entrance of the peritoneal cavity *via* one of the vaginal routes. Such entry does not constitute an operation in itself _ unless it be simply for exploration, followed by closure, without the performance of any other surgical act _ but is usually the preliminary step to some definite procedure.

Varieties of Colpoperitoneotomy.—The most frequently employed are the following: _ Anterior Colpoperitoneotomy, in which the vaginal wall in the anterior vaginal fornix, is incised, and the vesico-uterine peritoneal pouch opened _ and Posterior Colpoperitoneotomy, in which the vaginal wall in the posterior vaginal fornix is incised, and the recto-uterine pouch or fold of peritoneum (Douglas' culdesac) is opened. For Para-vagino-vaginal Peritoneotomy, see p. 501.

Advantages and Disadvantages of Operations Upon the Female Intrapelvic Genital Organs via the Vaginal Route _ Versus the Abdominal Route.—This would open a topic full of much controversy _ in which the verdict would be largely influenced by the personal bias, trend,

and habit of the individual witness giving testimony. There are, of course, clearly cut indications in both fields _ but in proportion as the individual Surgeon may be in the habit of doing a larger number of his gynecologic procedures by one or the other route, so will he tend to assign a larger number of even borderline cases to that route toward which he more largely leans, or through which he may consider that he does better work.

A very elaborate consideration of this subject is given by Bandler _ the condensation of which follows:

(*a*) **Indications for Operation by Anterior Colpoperitoneotomy** _ Cystocele _ Descensus uteri _ Prolapsus uteri _ Many cases of hysterectomy.

(*b*) **Indications for Operation by Anterior Colpoperitoneotomy Worthy of General Acceptance.**—Exploration in such indistinct, intra-

Fig. 5693.—Sectional View of the Vaginal Fornices: _ **a**, Uterovesical fold of peritoneum forming the floor of the peritoneal pouch between the bladder and uterus, just above the anterior fornix; _ **b**, anterior vaginal fornix, forming the anterior dome of the vagina, just below the uterovesical pouch. In anterior vaginal peritoneotomy the peritoneum is opened after traversing the connective-tissue plane between the dome of the anterior vaginal fornix (b) and the floor of the uterovesical pouch (a); _ **c**, recto-uterine fold of peritoneum forming the floor of the peritoneal pouch (Douglas' culdesac) between rectum and uterus, just above the posterior fornix; _ **d**, posterior vaginal fornix, forming the posterior dome of the vagina, just below Douglas' culdesac. In posterior vaginal peritoneotomy the peritoneum is opened after traversing the connective-tissue plane between the dome of the posterior fornix (d) and the floor of the recto-uterine pouch (c); _ **e**, clitoris; _ **f**, meatus urinarius; _ **g**, vagina; _ **h**, rectum; _ **i**, bladder. (Modified from Sobotta.)

pelvic conditions as sterility and suspected extra-uterine gestation _ Production of artificial sterility by partial tubal excision _ Minor grades of adhesions of the adnexa, particularly when associated with retroversion or descensus uteri, or cystocele, where vaginal suspension may be performed _ Small, movable cysts of tubes or ovaries _ Small uterine fibroids, appropriate for myomectomy _ Movable retroverted or retroflexed uteri, which it may be desired to correct by vaginal suspension, shortening of the round ligaments by the vaginal route, or by fixing the round ligaments to the anterior uterine wall _ Cystocele, associated or not with uterine displacement, where vaginal suspension is to be applied to the child-bearing uterus, and vaginal fixation, to the non-child-bearing uterus _ Descensus, in large, heavy uteri, with thick,

lax abdominal walls, where vaginal suspension of the child-bearing organ, or vaginal fixation of the non-child-bearing organ is to be performed, together with amputation of the cervix, and perineorrhaphy _ Prolapse in large, heavy uteri, where in non-child-bearing organs high amputation of the cervix and high perineorrhaphy will be performed, and where, in child-bearing organs, a portion of the tubes is excised _ Hysterectomy of not too large uteri involved by carcinoma or fibromyoma, and where the uterus can be delivered vaginally, and where not too great width of broad ligament is to be excised.

Debatable Indications for Operations by Anterior Colpoperitoneotomy.—Some cases of ectopic gestation (before rupture) _ Medium size, movable, unilocular tumors, anterior to uterus _ Inflammatory involvement of the adnexa, not situated too far to either side, in multiparæ, with large vaginæ (including salpingo-oöphorectomy, or hysterectomy, but excluding the removal of pus tubes, or of tubo-ovarian cysts adherent to the lateral pelvic walls, unless the uterus be simultaneously removed) _ Moderately large and irregularly shaped fibroids, where the uterus cannot be first delivered before performing the myomectomy _ "Fairly large fibroids, not intraligamentous, for hysterectomy."

Contra-indications for Operations by Anterior Colpoperitoneotomy.—Where pregnancy is present _ Within a short time of labor, or abortion, unless hysterectomy be contemplated _ Where vaginal celiotomy or separation of the bladder have been previously performed _ Where the appendix is simultaneously involved, "and if the abdominal method permits of an advantageous operation (which is not the case in cystocele and prolapse)" _ If it be necessary to also explore the gall-bladder region or other intra-abdominal viscera _ In nulliparæ or multiparæ, whose vaginæ are so small that the perineum must also be incised _ In nulliparæ where the anterior vaginal fornix is of too short a curvature to admit of a sufficiently long incision, or where the cervix cannot be drawn down _ Tumors lying anterolateral to the uterus, interfering with the delivery of the uterus into the vagina (the delivery of the uterus into the vagina being an essential preliminary to the ready removal of other intrapelvic structures) _ "In instances where injury to the uterus in inflammatory disease may cause extension to the other side" (as in unilateral pyosalpinx) _ Tubes, ovaries, and tumors adherent to the lateral pelvic wall (unless hysterectomy be simultaneously performed) _ A uterus closely adherent to the posterior pelvic wall, or to the sigmoid, or rectum _ Tumors placed posteriorly to and adherent to the uterus _ Ovarian tumors, whose pedicles are twisted _ Larger multilocular ovarian tumors, particularly when adherent _ Larger solid ovarian tumors _ dermoid ovarian tumors, particularly when adherent _ Intraligamentous tumors and hematomata, especially if high in the broad ligament _ The majority of cases of extra-uterine pregnancy _ Larger, more irregular uterine fibroids, particularly if extending, laterally, into the broad ligaments.

Indications for Operations by Posterior Colpoperitoneotomy.—For differential diagnosis (especially in suspected extra-uterine pregnancy) _ For examination of the adnexa (aided by the opposite hand upon the abdomen) _ For freeing intrapelvic adhesions (sometimes combined with the insertion of the fingers through an anterior colpoperitoneotomy) _ To replace an incarcerated uterus _ For the vaginal delivery of the uterus and adnexa (especially where the structures are posteriorly placed, and the uterine ligaments are lax) _ For removing movable ovarian cystic tumors, which can be displaced backward into the pelvis _ For posterior parametritis and retrodisplacement of the uterus _ For intrapelvic drainage _ For pelvic abscess _ As a preliminary step to vaginal hysterectomy.

The above lists of graded indications and contraindications, for anterior and posterior colpoperitoneotomy, probably represent an extreme degree of application of the vaginal routes to gynecologic surgery.

For the purpose of comparison, will be summarized from Howard C. Taylor's writings, the predominant features and the fields of application of the vaginal routes, in operating upon the female genital organs and intrapelvic structures.

General Advantages of the Vaginal Routes.—(1) Avoidance of diffusion of a localized into a general peritoneal infection. The infected structures usually lie low in the pelvic cavity, tending to gravitate toward Douglas' culdesac, walled off from the general peritoneal cavity by intestines. In operating by the vagina, this barrier is usually preserved _ while it is necessarily opened, in operating through the abdomen. (2) Hernia is less frequent, especially through a Pfannenstiel scar (though much rarer now than formerly, through any scar). (3) Scarring is avoided _ though also avoidable through a Pfannenstiel incision. (4) Shock is less _ probably because fewer sensory nerves are divided in entering the peritoneal cavity. (5) Briefer, more comfortable convalescence.

General Disadvantages of the Vaginal Routes.—(1) More difficult technic. (2) Longer duration of operation. (3) Restricted field of operation. (4) Impossibility of as complete examination of the intrapelvic structures, when approached by the vaginal as compared with the abdominal route. (5) Impossibility of as careful technic in the surgical repair of the parts. (6) Greater frequency of intra-operative and postoperative hemorrhage. (7) Greater danger of injuring the bladder, rectum, and ureters. (8) Subsequent peritoneal adhesions are more frequent.

Taylor finally summarizes the indications for vaginal coeliotomies, in his judgment, to the following: _ That, excepting vaginal hysterectomies, vaginal coeliotomy should be reserved for drainage _ for simple excisions, through roomy vaginæ, by skilled Surgeons _ and for those patients whose general condition demands that the operation with minimum shock be selected.

Taylor gives the following:

Conditions Under Which Operation by the Vaginal Routes May Be Performed.—(1) For the diagnosis of extra-uterine pregnancy _ of malignancy of the uterus _ and for the separation of adhesions _ by the posterior vaginal route. (2) For drainage of intrapelvic abscess _ and for either the resection or excision of one, or of both ovaries, or tubes (reserving the abdominal removal of inflamed appendages for older women, who have largely completed the physiologic life of these structures _ and the vaginal drainage of these structures for younger women). (3) Extra-uterine pregnancy (either unruptured, ruptured accompanied with a small hematocele), or infected. (4) Removal of ovarian cysts of moderate size, encountered during a vaginal operation for some other purpose _ ovarian cysts not larger than from 10 to 12.5 cm. (4–5 inches), with thin fluid and no adhesions (other ovarian cysts being removed by the abdominal route) _ or ovarian cysts, lying low in the pelvis, and discovered during the latter months of pregnancy, or at confinement. (5) Vaginal drainage of benign ovarian cysts, encountered during late pregnancy, and not removable by the vaginal route, because of adhesions or other causes. (6) Vaginal drainage of small, benign ovarian cysts (not over 7.5 cm., or 3 inches) in a woman to whom the preservation of the ovarian structure is important. (7) Myofibromata of moderate size, with roomy vagina _ of either the submucous, interstitial, or subperitoneal variety. (8) Prolapse of the uterus, by the interposition operation, in women who have passed the child-bearing period, or who have been rendered sterile.

General Summary of the Indications for Operation Upon the Female Intrapelvic Organs and Structures by the Vaginal Routes.—In the judgment of the Author, very many more borderline cases are operated upon by the vaginal route than are, surgically, due to be operated upon by this route – and, undoubtedly, much desirable technical detail and thoroughness have been omitted, to the detriment of the patient, and to the discredit of the Surgeons, which could have been easily, and would have been certainly, carried out by the abdominal route. It is not logically natural to expect the same grade of surgical work in a narrowed, obscured, and variously handicapped field, that one has the ability to obtain, and verify, in an open field.

Comparison of the Anterior and Posterior Vaginal Routes.—The details of the operations by these routes will be given in the following sections – suffice it to say, here, that in operating by the anterior vaginal route, a larger type of operation with a somewhat more difficult dissection, is required, but that more working room and better accessibility to the structures are secured – while the operation by the posterior vaginal route is easier of performance, and intrapelvic abscess and most ovarian cysts are best operated by this route.

ANTERIOR COLPOPERITONEOTOMY

Description.—The above designation signifies the incision of the anterior vaginal fornix and the uterovesical fold of peritoneum, for the purpose of

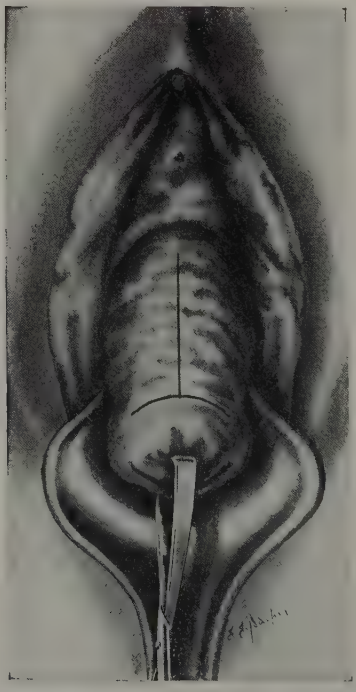


Fig. 5694.—Anterior Colpoperitoneotomy – I; – The inverted T-shaped vaginal incision.

gaining access to the peritoneal cavity by this, the anterior one of the vaginal routes. The procedure does not constitute a completed operation in itself – but is merely the means of gaining access to the intraperitoneal region, by this route, for the accomplishment of some preconceived object – as, for instance,

a preliminary to vaginal hysterectomy. It is here used as equivalent to, and more anatomically descriptive, than the term "anterior vaginal celiotomy." Anterior colpotomy, so often used in the above sense, does not, derivatively, mean more than cutting the vaginal wall, without necessarily covering the section of the peritoneum – as is illustrated where one evacuates an extraperitoneal pelvic abscess by a posterior colpotomy, in contradistinction to operating upon an intrapelvic abscess whose outer wall is peritoneum, though adherent, by posterior colpoperitoneotomy. Except, therefore, in simple exploratory anterior colpoperitoneotomy, ending in nothing else, is the operation in itself an entity. In many works, anterior and posterior colpoperitoneotomy are not described at all, as separate operations, but are covered as preliminary and intermediate steps toward various end-goals.

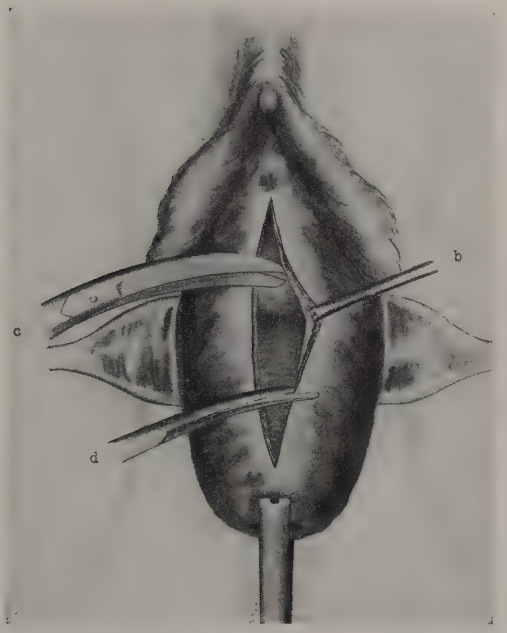


Fig. 5695.—The Same – II; – The median vaginal incision has been made – and the margins of the vaginal flaps, held by forceps, b, are being freed by combined blunt and sharp dissection (the latter by scissors snips, c, which are in the act of freeing the vaginal flaps from the bladder) – while the transverse addition to the median incision is being made by the scissors, d. The transverse incision may be at the cervico-uterine end of the median incision, which then does not extend down as far as here shown – or it may be placed at any higher level of the vertical cut.

General Indications for Anterior Colpoperitoneotomy.—The special advantages of as well as indications for anterior colpoperitoneotomy – compared with those for posterior colpoperitoneotomy, are given under Colpoperitoneotomy, in General (v. p. 368).

Operation.—The patient, under anesthesia, is placed in the dorsal posture – with a posterior vaginal retractor in position, and the uterus, the cervix of which has been seized by volsellum forceps, is drawn into the field, while the anterior vaginal wall, seized just above the meatus, is drawn in the opposite direction. In proportion, as the uterus may be readily delivered into the vaginal outlet, will the procedure be facilitated. While the parts are thus held, and the uterus pressed against the posterior vaginal wall, a median incision is made through the anterior vaginal wall, from just above (below, in the position of the pa-

tient) the vaginal forceps, to the reflection of the vagina onto the cervix (Fig. 5694). In the majority of instances, some form of transverse incision is added to the lower aspect of the median incision. This latter incision may be added to the lower end of the vertical cut, making the incision into an inverted T – or, in the progress of the separation, it may be added at a somewhat higher level (Fig. 5695, **d**). The details of the second cut will be largely determined by the exigencies of the special operation. One aims, in making the median incision, to get right into the connective-tissue cleavage plane, as the first rallying point to the easy progress of the operation – and this is more readily done in the median line, in the looser tissue over the bladder, rather than where the connection to the cervix is firmer, though, occasionally and

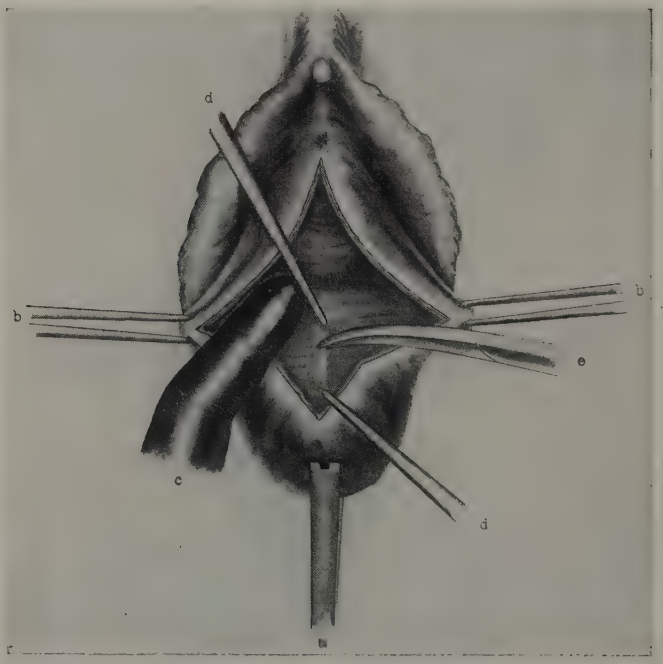


Fig. 5696.—The Same – III; – Opening the vesico-uterine peritoneal pouch by transverse incision: – **a**, Vulsellum, drawing the cervix downward and backward; – **b, b**, tenaculum forceps, drawing the vaginal flaps outward; – **d, d**, tenaculum forceps forming a short median ridge of the presenting vesico-uterine peritoneal pouch; – **e**, scissors transversely dividing this ridge preparatorily to extending the peritoneal section outward, to either side.

exceptionally, the reverse is the case. Working within the connective-tissue plane, largely by blunt dissection, with an occasional scissors snip, if necessary, the vaginal flaps are freed outward, from both the cervico-uterine wall and from the bladder wall. It is during this stage that the lateral transverse cut into the vaginal flaps are often made with scissors – when not included as a part of the original incision by knife. They are usually made a short distance below the lower limit of the bladder. A gauze-covered finger is often useful in the blunt dissection carried on in the various separations.

The separation of the bladder from the anterior vaginal wall and the anterior fornix, in front, and from the cervix uteri and body of the uterus, behind, is next accomplished. The separation from the anterior fornix and vaginal wall has already been largely accomplished by the lateral retraction of

the vaginal flaps in the progress up to this stage, and if further separation be indicated, this is secured through a continuation of these steps, extending higher and further to the sides. The separation of the bladder from the anterior wall of the cervix and from the lower aspect of the body of the uterus is best secured by depressing the cervix posteriorly, by means of the forceps which grasp it, at the same time that the partially freed bladder is retracted upward _ and then, by the same method of blunt dissection, accomplished largely by the gauze-covered finger, combined with scissors snips, carried on in the interuterovesical plane of connective tissue, the bladder is freed from the anterior wall of the cervix and lower part of the body of the uterus _ up to the uterovesical peritoneal fold. This separation is a little less easy over the cervix, where the uterovesical ligament requires division _ and easier as one

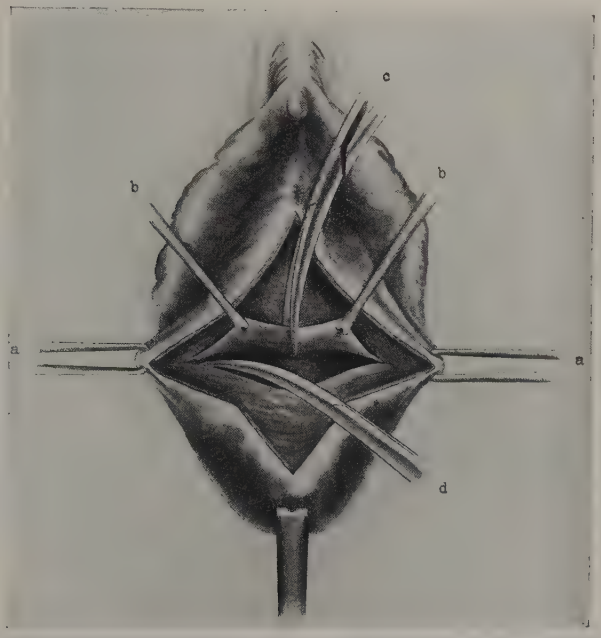


Fig. 5697.—The Same _ IV: _ **a, a,** Tenaculum forceps laterally retracting the vaginal flaps; _ **d,** scissors laterally enlarging the transverse opening in the peritoneum; _ **b, b,** tenaculum forceps tensing the upper margin of the peritoneal opening _ while scissors, **c,** are in the act of increasing this opening by adding a limited median cut.

ascends. It is at this stage, especially in the more difficult cases, that an intravesical sound will be of service in guiding the Surgeon. This, however, is rarely necessary _ and is condemned by some, as exposing the bladder to additional danger, by causing it to assume unnatural relations. If the bladder has been well exposed in the separation of the vaginal flaps, the following of its lower contour, at this stage, is easier. But if not, and it be not readily exposed in the median line, where the uterovesical ligament may somewhat block progress, then the lateral aspects of the lower bladder contour are exposed first _ and then the median. It is here that the transverse portion of the vaginal incision is conspicuously useful.

The opening of the vesico-uterine peritoneal pouch is the final step of the simple operation. When the bladder is held upward by a retractor and the cervix is depressed against the posterior vaginal wall, the peritoneal pouch is

usually readily demonstrable _ and no attempt should be made to incise its structure until it is plainly located. When the peritoneal pouch is isolated, its two lateral aspects are seized with forceps, and it is incised by a transverse cut between these _ or, if there be any likelihood of doing damage (such as cutting a coil of intestine within the cavity), two forceps, one about 1.3 cm. ($\frac{1}{2}$ inch) above the other, make a small ridge of the peritoneal pouch, which is then carefully incised, laterally, by scissors (Fig. 5696) _ after which this small incision is continued, to right and to left, by blunt scissors (Fig. 5697), one blade of which is introduced into the peritoneal cavity. This transverse incision is usually from 3.7 to 5 cm. ($1\frac{1}{2}$–2 inches) in extent. While the perito-

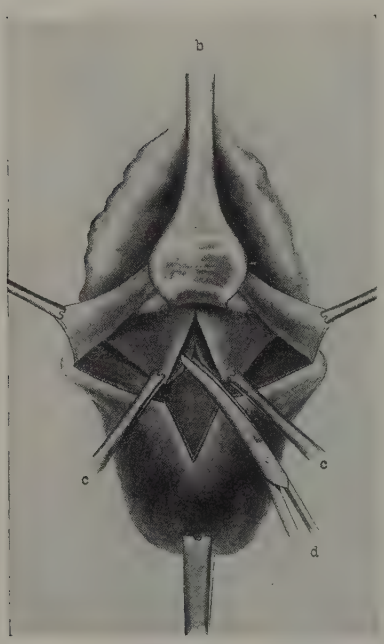


Fig. 5698.—The Same _ V; _ Opening the vesico-uterine peritoneal pouch by a median incision, an alternate method, while the pouch is ridged laterally by the forceps, **c, c;** _ adding a transverse cut to the median section by the scissors, **d.** The bladder is held well upward by the retractor, **b** _ and the cervix well downward and backward.

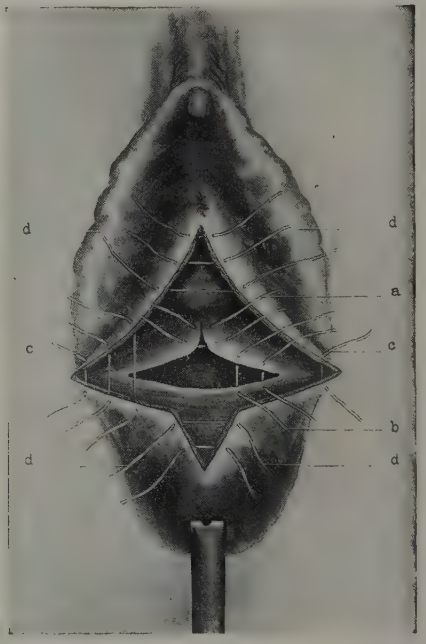


Fig. 5699.—The Same _ VI; _ The closure of the vaginoperitoneal wound: _ **a,** Sutures closing the median portion of the peritoneal wound; _ **b,** sutures closing the transverse portion of the peritoneal wound; _ **c, c,** sutures closing the transverse portion of the vaginal flaps; _ **d, d,** sutures closing the median portion of the vaginal flaps.

neum is probably more frequently opened in a transverse direction _ as affording more room for the more extensive subsequent manipulations of special operations, it is often opened in the median line (Fig. 5698) _ and in such operations as vagino-suspension, the median section of the peritoneum must be used. In commencing this median section of the peritoneum, the two forceps first make a limited transverse ridge, which is divided _ after which the incision is continued upward and downward as far as indicated, or to the attachments of the peritoneum to the bladder, in front, and uterus, behind. In using the transverse section of the peritoneum, branches of the uterine arteries may bleed in the lateral extensions of the cut.

At the end of the simple operation, or after the accomplishment of the special object of the procedure _ and where the margins of the peritoneum are

not to be used in any part of the special operation _ and it be not indicated to keep any portion of the peritoneal opening patulous _ the borders of the incised peritoneal pouch are brought together by several interrupted plain catgut stitches _ or a continuous stitch (Fig. 5699). After seeing that the bladder and uterus have been restored to their normal positions, the margins of the vaginal flaps are brought together by fine chromic catgut sutures. Unless there be indication for instituting drainage in the special operation, none is employed.

POSTERIOR COLPOPERITONEOTOMY

Description.—The above designation signifies the incision of the posterior vaginal fornix and the recto-uterine fold of peritoneum, for the purpose

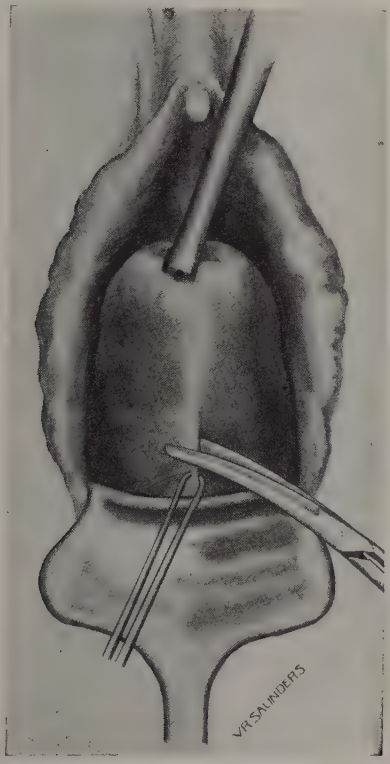


Fig. 5700.—Posterior Colpoperitoneotomy _ I; _ The uterus is drawn downward and forward by strong volsellum forceps, exposing the posterior aspect of the cervix. A longitudinal ridge is formed by grasping the mucosa with tenaculum forceps, which the scissors are about to divide transversely, thus entering the connective-tissue plane of the posterior vaginal fornix.

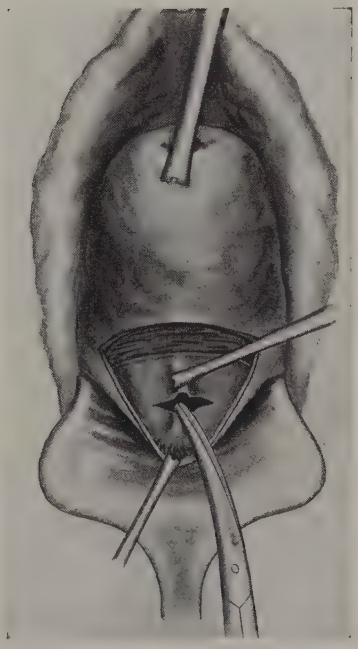


Fig. 5701.—The Same _ II; _ The mucosa is divided and the flap of mucous membrane and connective tissue displaced backward. A pouch of peritoneum, the floor of Douglas' culdesac, is thus exposed in the connective-tissue plane between uterine wall and mucous membrane. A longitudinal ridge of this peritoneal pouch is then picked up with forceps and divided transversely by scissors _ opening up the free peritoneal cavity.

of gaining access to the peritoneal cavity by this, the posterior one of the vaginal routes. The procedure, as in the case of anterior colpoperitoneotomy, just described, does not constitute an entity or completed operation in itself _ but is simply the means, or avenue, of gaining access to the intraperito-

neal cavity by this route – as, for instance, in evacuating pus, either free in the pelvic peritoneal cavity or localized in Douglas' culdesac. The term is used, in the present writing, as equivalent to, but possibly more anatomically descriptive than, the term "posterior vaginal celiotomy." It may be also said of the frequently employed term "posterior colpotomy," as already said of anterior colpotomy, that the former term does not, by derivation, signify more than merely cutting the posterior vaginal wall, without necessarily im-

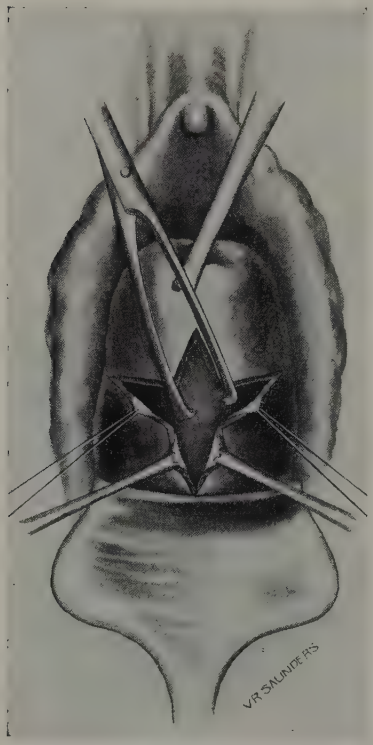


Fig. 5702.—The Same – III; – A still different method of exposing and entering the posterior peritoneal cavity is here shown. A transverse incision by knife or scissors is made, as in Fig. 5701, as well as a longitudinal incision – following which the lips of the quadrangular wound are retracted laterally and anteriorly and posteriorly. The incised peritoneum is shown in the grasp of tenaculum forceps and thread tractors. Volsellum forceps are entering the opened Douglas' culdesac of peritoneum.

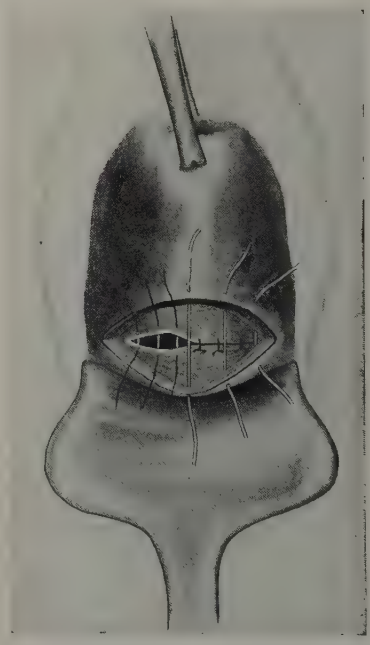


Fig. 5703.—The Same – IV; – Suturing the peritoneum and vaginal wall of an ordinary transverse opening.

plying the section of the peritoneum – and should not be used synonymously. Only when in simple exploratory posterior colpoperitoneotomy, nothing more is done than explore, is the operation in itself an entity. Frequently, in surgical writings, anterior and posterior colpoperitoneotomy – or anterior and posterior vaginal celiotomy, or anterior and posterior colpoceliotomy, are not described as separate operations – but are covered as preliminary and intermediate steps toward various surgical ends.

General Indications for Posterior Colpoperitoneotomy.—The special

advantages of, as well as indications for, posterior colpoperitoneotomy – compared with those for anterior colpoperitoneotomy, are given under Colpoperitoneotomy, in General, (v. p. 368).

Operation.—The patient is placed in the dorsal gynecologic posture – the posterior vaginal wall is forcibly retracted downward – and the posterior lip of the cervix is seized with volsellum forceps, and drawn well downward and forward – thus widely exposing the posterior vaginal fornix. The vaginal

Fig. 5704.—The Same – V; – Suturing the transversely divided peritoneum and medially divided vaginal fornix.

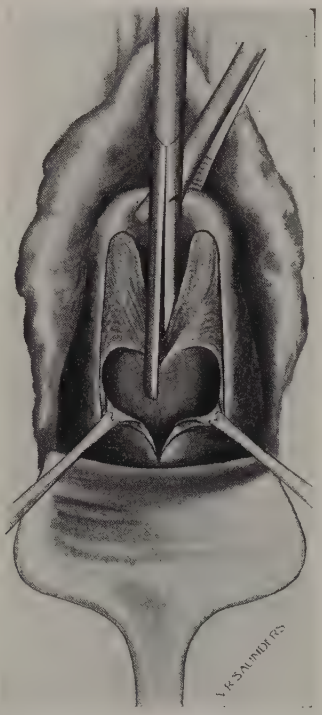


Fig. 5705.—Posterior Vaginal Peritoneotomy and Division of the Cervix; – This illustration is not a step of the technic represented in the preceding figures, but shows that the posterior peritoneal pouch may be entered – especially where roomy exposures for larger manipulations are indicated – by boldly cutting through the posterior aspect of the cervix, in the median line, by means of stout scissors, one blade of which enters the uterine cavity. The margins of the incised peritoneum are shown grasped against the incised uterine wall and mucosa by tenaculum forceps.

mucosa is seized in the median line, with forceps, at a level of about 5 cm. (2 inches) from the external os, in such a way as to form a short median ridge. With blunt-pointed scissors, this ridge is transversely divided, just distal to the grip of the ridging forceps (Fig. 5700) – and the posterior vaginal wall further cut outward, upon both sides. The recto-uterine peritoneal pouch is then recognized, in the bed of this incision, and similarly prominently ridged by forceps, and divided transversely (Fig. 5701). Often the vaginal wall, areolar tissue beneath the peritoneum, and the peritoneal pouch are cut

through by the single closure of the scissors – although the recognition of the progress of the incision is safer. If the section be placed too close to the cervix, the peritoneum is apt to be freed, in the subsequent dissection, from the uterus – working in the connective-tissue plane between the two, rather than entering the peritoneal pouch. If it be made too high up in the posterior fornix, the rectum is apt to be cut. It is wiser to proceed deliberately – recognizing and ridging the peritoneum before incising it. The transverse incision is usually extended, on either side, up to the uterosacral ligament.

Sometimes a median incision is made, rather than a transverse – and sometimes both median and transverse are combined – as in Fig. 5702. This combination is useful when considerable room is required.

It is always desirable to at once stitch the margin of the incised peritoneum to the posterior lip of the incised vaginal wall, until the end of the operation (v. Fig. 5703).

In entering the peritoneal cavity, care is to be taken that the blades of the scissors do not close upon a knuckle of small intestine.

Some little bleeding may be expected from the lateral aspects of the transverse incision.

After completing the object of the operation the wound is closed – without drainage (unless, for some reason, this be indicated). The incised peritoneal pouch is closed by fine, buried chromic catgut stitches – uniting the free margin of the peritoneum (which was temporarily stitched to the posterior lip of the vaginal incision) to the lower margin of the peritoneum covering the posterior aspect of the uterus (Fig. 5703) – after which the margins of the vaginal incision are brought together by superficial chromic catgut stitches. Sometimes the vaginal wall is incised vertically and the peritoneal pouch opened transversely – and, in the closure, the margins are brought together in the corresponding directions (Fig. 5704).

Comments.—Where the maximun room is required – as in removing submucous, interstitial, or subperitoneal fibroids, the posterior peritoneal pouch and the posterior cervical wall may be simultaneously laid open by a bold, posterior median section, made with stout scissors – as in Fig. 5705. At the end of the operation the peritoneal pouch is closed in the usual manner – and the cervix repaired as in ordinary trachelorrhaphy.

OPERATIONS FOR THE EVACUATION AND DRAINAGE OF INTRAPELVIC ABSCESSES BY THE VAGINAL ROUTE

Varieties of Intrapelvic Suppuration Most Frequently Encountered in the Female:

(*a*) Within the parametral connective tissue, and not bounded by a peritoneal wall.

(*b*) Within the parametral subperitoneal connective tissue – occurring within the connective-tissue plane, and backed or bounded by pelvic peritoneum – (outside of the peritoneum).

(*c*) Within the pelvis, in the vicinity of the vagina, bladder, or rectum – and not necessarily coming within the category of either (*a*) or (*b*).

(*d*) Within the layers of the broad ligaments (intraligamentary).

(*e*) Within the uterine wall.

(*f*) Within the ovaries.

(*g*) Within the fallopian tubes – the most frequent source of intrapelvic abscess.

(*h*) Within a walled-off part of the pelvic peritoneal cavity – usually in Douglas' recto-uterine pouch – within which infection and suppuration having their origin elsewhere (as in the appendix) may become localized.

Methods of Evacuating Intrapelvic Abscesses Associated with the Female Generative Organs:

(1) By colpotomy – usually posterior – sometimes lateral – rarely anterior – where the abscess is subperitoneal, if it lie opposite peritoneum – or paravaginal, or parametral, if non-subperitoneal.

(2) By colpoperitoneotomy – usually posterior. The most frequently employed operation for the evacuation and drainage of localized intrapelvic suppuration.

(3) By abdominal section, and the removal of the unopened pus sac, or structure, if possible, with closure of the pelvic cavity without drainage – as in the removal of pus tubes and ovaries.

(4) By abdominal section, followed by drainage through the wound of entrance. An emergency alternative, often forced by circumstances.

(5) By abdominal section, to discover the exact site and nature of the suppuration – followed by the establishment of evacuation and drainage by the vaginal route, while the abdomen is open, and under the guidance of sight and the help of intra-abdominal manipulation, but without involving the uninvolved portion of the peritoneal cavity by contact with open sources of infection – after which the abdomen is closed.

Choice of Method of Operation.—Evacuation and drainage should be performed by the vaginal route – when the Surgeon feels convinced of the nature of the suppurating process, and its site – and reasonably certain of his ability to evacuate and drain it without assuming an overbalancing risk of seriously damaging important neighboring structures – especially the wounding of intestines, and the opening of the free peritoneal cavity – and, in operating upon the lateral aspects of the vaginal vault, of hemorrhage, from the uterine vessels, and of traumatizing the ureters.

Abdominal section, followed by closure, without drainage, is ideal where it is possible to isolate and remove, unopened, the pus-containing structures.

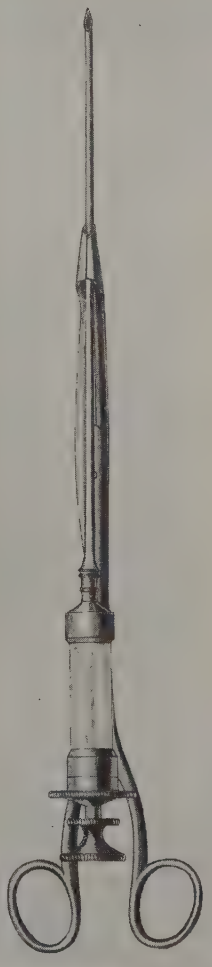


Fig. 5706.—Landau-Josephson's Forceps-holding and Gaging Exploratory Syringe.

Intra-abdominal exposure and determination of the exact nature and site of the abscess, followed by vaginal evacuation and drainage under such guidance, should be the course to follow – if the vagina route be considered dangerous, uncertain, or inadequate, as is sometimes the case – and if clean intra-abdominal excision of the pus structures, followed by closure, be impossible.

The error of contending for the wisdom of undertaking to drain almost all cases of pelvic abscess by the vaginal route – in spite of the vigorous contro-

versies in its upholding – must be apparent when two facts, alone, are considered – first, the large number of different causes, sources, and sites of intrapelvic abscesses (as seen, above, in the table of these abscesses) – and, second, that no matter what be the kind, complication, or situation of the intrapelvic abscess, it is almost invariably operated upon by what, practically, amounts to one single line of procedure for all cases – and that, none too surgical – of cutting an opening in the posterior vaginal fornix, and then burrowing in the dark, with instrument, or finger, hoping and trusting to break through walls which bar pus from evacuation – and not break through walls which protect uninfected cavities, or into uninvolved structures and organs. Evacuation by the vaginal route has its place in many cases – but its place is not in every one – nor, is it believed, in as many cases as it is employed.

Needle Exploration for Suspected Intrapelvic Abscess by the Intravaginal Route.—Where the presence of abscess is reasonably clear – and

Fig. 5707.—Exploratory Puncture of an Intrapelvic, Postuterine Abscess or Hematoma – through a needle guided by the finger, and guarded, as to depth of puncture, by a split shot clamped at a predetermined distance from its point.

sometimes the fluctuation in the posterior vaginal fornix is unquestionable – it is generally considered wiser to at once incise, rather than first explore – realizing the dangers of wounding adjacent structures with a needle point, and of also diffusing contagion thereby. If, however, despite this – and in those cases where one may be unwilling to incise until they actually obtain pus by exploration – Landau-Josephson's forceps-holding and gaging exploratory syringe is especially serviceable (Fig. 5706). A split shot, compressed at the level of the maximum depth to which it is intended to thrust the needle, will answer, practically, almost at well. The use of such a safe-guarded needle is shown in Fig. 5707. A gloved finger should precede the needle to the dome of the posterior vaginal fornix – and along this the needle is conducted – and introduced to the predetermined depth – after which the piston is withdrawn. In proportion as fluctuation is felt in the fornix may one proceed with relative boldness – and in proportion as corroboratory signs of pus, as elicited digitally are absent, must progress be correspondingly careful. In

making the puncture a good guide is to keep as parallel as possible with the posterior wall of the uterus which has been drawn down by the volsellum forceps – rather than to point toward the rectum. If pus be brought out into the barrel of the syringe, the barrel may be detached, and the incision be then made alongside of the needle, the end of which, it has been established, lies within the free pus cavity, as a guide to both its position and depth. Or the needle may be withdrawn, and the incision made along independent lines, but guided largely by the preliminary exploration.

The anatomic relations of the parts should be well understood in advance (v. pp. 520–526).

Incision, Evacuation, and Drainage of an Intrapelvic but Extraperitoneal Abscess by Transverse Colpotomy in the Posterior Vaginal Fornix.—As it can never be definitely known in advance – and, sometimes, not even afterward – whether an abscess be extraperitoneal or intraperitoneal, in the form of a walled-off localization of pus – it is well to proceed as though the peritoneal boundary is likely to be transgressed. The details of the latter operation will, therefore, be given under the heading of the next paragraph – it being understood that the technic is, essentially, the same. While theoretically, however, the extraperitoneal abscess may present a simpler, more superficial problem, it may, on the other hand, especially if laterally or distantly situated, prove a much more difficult and dangerous undertaking than would an average posterior median intraperitoneal abscess. The incision of approach is simply through the vaginal wall, and does not pass through any portion of the peritoneum. When the cavity is located, the rest of the details are the same as in the operation about to be described.

Incision, Evacuation, and Drainage of an Intrapelvic and Intraperitoneal Abscess by Transverse Colpoperitoneotomy in the Posterior Vaginal Fornix.—In these cases the peritoneal boundary must be crossed before the site of pus is reached – although such a degree of adhesions, or other changes, may exist as to make it impossible to ever recognize what part of the operation is extraperitoneal, and what part intraperitoneal, mistakes being, undoubtedly, often made in both directions. The general technic will be here described – and then some variations from it as well as other bearings will be given under Comments. Operation will be here considered in its application to an intrapelvic abscess in the sense of these pus collections as covered by the words of Howard Canning Taylor: – "By pelvic abscess is meant any collection of pus in the pelvis, whether it be a part of the peritoneal cavity shut off by peritoneal adhesions, or between the layers of the broad ligaments, as may result from the infection of a ruptured ectopic pregnancy, or, as is by far more frequently the case, either in the tube of a pyosalpinx, or in the ovary, as an ovarian abscess. The exact location of the pus is often not easy to determine, and may not be essential to the proper treatment of the case. After the pus has been evacuated it is best not to risk the separation of adhesions in order to determine the exact organ in which it originated."

Several different methods are in use in the actual opening of these abscesses, though some of the features of the procedure are more or less common to them all. A posterior vaginal speculum is usually employed – with or without the aid of an anterior or lateral retractor. Often, however, none is used. The posterior cervical lip is generally seized by volsellum forceps, and drawn downward and upward – which, with the backward pressure of the posterior vaginal speculum, will tend to open out the posterior vaginal fornix, besides bringing it nearer the vaginal outlet. Sometimes, in very evident and superficial cases, closed scissors are simply conducted up along the left index-finger without the aid of speculum or retractor, and transversely incise the pus sac protrud-

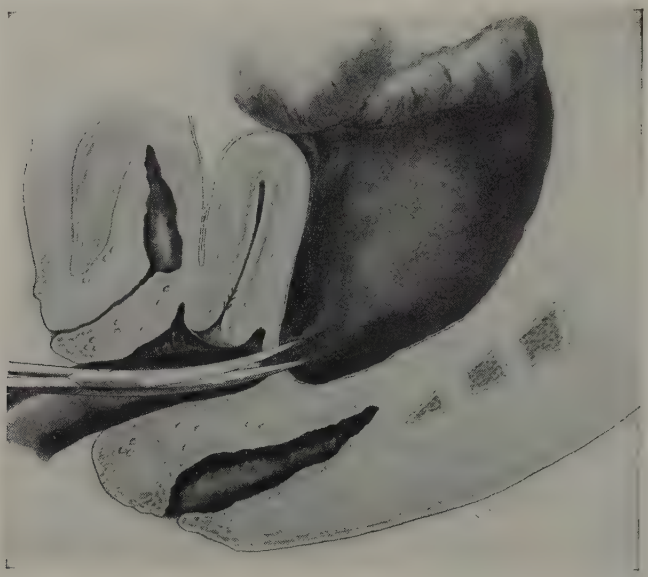
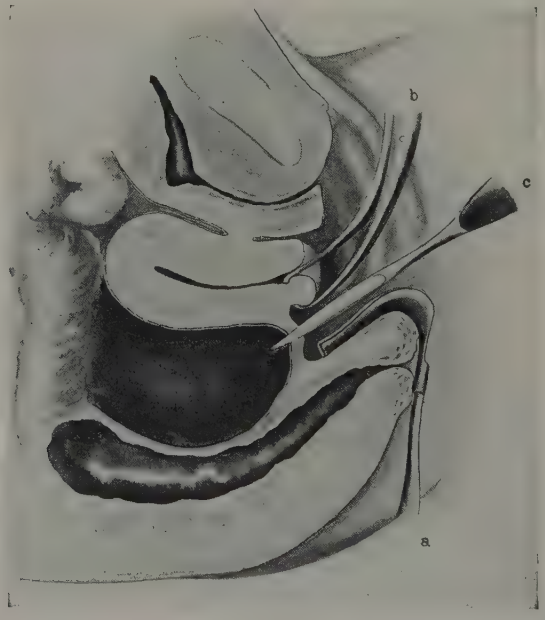


Fig. 5708.—Incising, With Scissors, an Intrapelvic Abscess or Hematoma Through the Posterior Vaginal Fornix – the incision being made by pointed scissors, the blades of which are separated in the act of withdrawal, so as to enlarge the extent of the outlet.



Fig, 5709.—Incising, with Knife, an Intrapelvic Abscess or Hematoma in Douglas' Culdesac – the operation being a colpotomy if only the postvaginal connective-tissue plane be entered – and a colpoperitoneotomy if vagina and recto-uterine peritoneal pouch be incised: a, Retractor depressing the posterior vaginal wall; – b, volsellum forceps, drawing the posterior cervical lip downward and upward.

ing into the dome of the posterior fornix (Fig. 5708). This may be done with curved, sharp-pointed scissors – but curved, blunt-pointed Mayo scissors are

safer (unless, as sometimes occurs, the entry can only be made by sharp scissors). A knife, which is sometimes employed for the initial incision, is never used unless the parts be well retracted (Fig. 5709).

As the finger naturally blocks the way considerably, more direct access can usually be gotten by grasping the posterior cervical lip with volsellum forceps, and the posterior vaginal wall, at about 1.9 cm. ($\frac{3}{4}$ inch) below the dome of the fornix, with tenaculum forceps, and then incising with curved, blunt scissors – and subsequently following the plane of the posterior uterine wall, rather than directing the instrument toward the rectum (Fig. 5710).

Kelly's technic is to carry the left index-finger up into the posterior vaginal fornix and the left middle finger into the rectum, so that the progress of

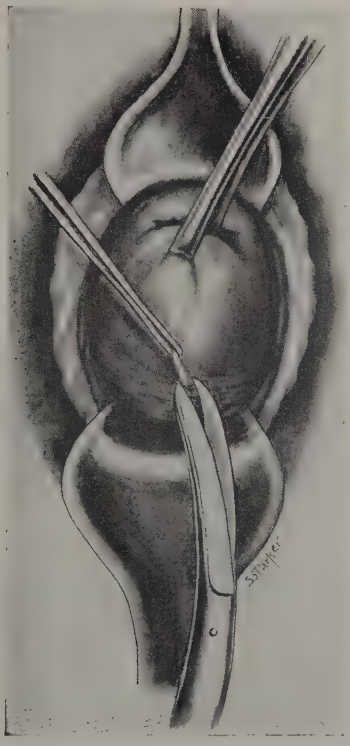


Fig. 5710.—Opening the Posterior Vaginal Fornix and Recto-uterine Peritoneal Pouch by Means of Curved, Blunt-pointed Scissors – after retracting the posterior vaginal wall, drawing down the cervix, and medially ridging the vaginal mucosa of the posterior fornix.

the scissors, in the right hand, will be guided by the finger in each of these structures – thereby lessening the danger of damaging the intestine.

If the opening be made with scissors, it is dilated by opening their blades in the act of withdrawal. Or the vaginal opening may be dilated by subsequently introducing a pair of special forceps, whose blades are then opened as far as necessary (Fig. 5711). A uterine dilator makes a good instrument for the purpose.

Following the sufficient opening up of the incision the index-finger should be introduced into the incised tract – and search be made by this finger, aided, often, by a hand over the abdominal region to press the parts downward – backward, upward, and lateralward – so as to open up into the one common

Fig. 5711.—Dilatation of the Vaginal Opening in the Posterior Fornix by Means of Uterine Dilators.

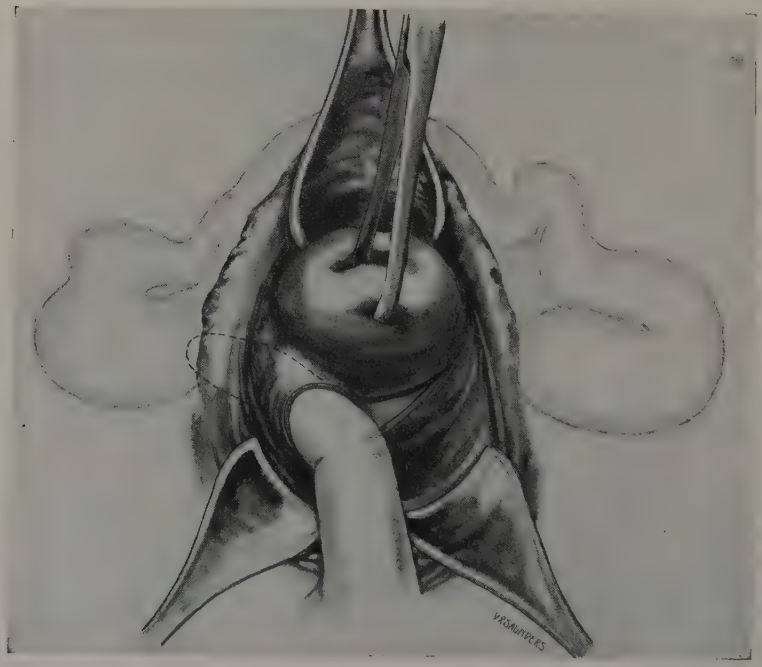


Fig. 5712.—Blunt Dissection Into an Adherent Pus Tube Through an Incision in the Posterior Vaginal Fornix, Without Opening the General Peritoneal Cavity; – At the median site, at which the vaginal fornix has been incised, it will be seen that the peritoneum remains unopened – while the finger, working lateralward, by blunt dissection, is breaking through the peritoneal adhesions between tube and parietal peritoneum, into the cavity of the tube. (Redrawn from Kelly.)

exit all collections of pus which may be present and not otherwise in direct communication with the cavity at first opened (Fig. 5712). Or the original incision may lead down to the near proximity of pus without directly leading into it – the rupture of the final barrier being accomplished by the finger.

When evacuation has been complete – and no reasonable doubt remains that all barriers have been broken down between the first incised and other possible localizations of pus – safeguarding, also, as well as is humanly possible, that no safety barriers have been broken down between infected and non-infected intraperitoneal structures – the question of drainage is to be considered. These pus cavities are generally drained by means of loose gauze packs, carried into the pus cavity, and conducted thence, out into the vagina, and to the vaginal outlet (Fig. 5713). Sometimes one or two fenestrated rubber tubes, of fairly large size, are inserted instead of gauze – but

Fig. 5713.—Gauze Drainage of an Intrapelvic Abscess Through the Dome of the Posterior Vaginal Fornix.

pressure of the intrapelvic end is more capable of doing damage, than is the gauze. When rubber tubes are used they should not go far into the pus cavity, as they are then less apt to come into contact with nearby coils of adherent intestine, which may form one of the boundaries of pus cavity (Fig. 5714). It is also more difficult to hold a rubber tube in position – unless it be anchored by a stitch.

Comments.—It goes without the saying that intrapelvic abscesses should be incised as early in their course as possible – and long before they become such bags of pus as suggested by some of the accompanying illustrations – where some of them seem to be about to evacuate themselves. It is the incision and drainage of these early and more or less obscure, and more or less distant abscesses, which reflect particular credit. Anesthesia will be often indicated for such early diagnosis and subsequent evacuation. While, there-

fore, it is easier and safer (to neighboring structures) to evacuate advanced intrapelvic abscesses, it is less to the Surgeon's credit and less to the patient's welfare.

In operating upon an abscess situated well up in the pelvis it is to be remembered that a retroverted or retroflexed uterus will somewhat and maybe considerably bar the way to its incision and evacuation – and, correspondingly, expose the rectum to the danger of being cut.

The technic of reaching more distantly situated intrapelvic abscesses is well shown in Fig. 5715. A pair of curved, blunt-pointed scissors is used, of a length which will lend themselves to the technic, and preferably of the Mayo type. They are held in the right hand, and the left index-finger travels immediately below and in contact with them, ready to examine the space opened

Fig. 5714.—Rubber Tube Drainage of an Intrapelvic Abscess Cavity Through the Posterior Vaginal Fornix.

up by each cut and dilatation. The position of the back of the right index tends to press the anterior rectal wall out of the way during the advance. The curvature of the scissors hug the connective-tissue plane just posterior to and parallel with the posterior wall of the uterus. The scissors first cut, are then opened, and the finger follows – and this series of acts is repeated for each increment of increase in the advance – verifying the progress and estimating the nature of the surroundings by means of the finger before making new advance. The special safety guide is the relatively resistant posterior uterine wall. All retractors are usually withdrawn during this procedure – the uterus simply being drawn down by vulsellar traction upon the posterior lip. Just as the dissection is made between the uterus and the abscess is there safety – and danger, as it is made between the rectum and the abscess. If the cervico-uterine wall be too zealously hugged, progress may be blocked,

or confused, by inadvertently cutting into uterine tissue. When the wall of the pus cavity itself is reached, the blunt scissors are sometimes exchanged for sharp ones – with which it is carefully cut through.

Guard against mistaking a scybalous mass in the rectum for the inflammatory and infected mass – and against mistaking a gaseous distention of the rectum for a fluctuating pus cavity. If there be doubt, a rectal or a bimanual rectal and vaginal examination should be made during the operation, and gloves changed. In breaking through partitions which may wall off adjacent pus pockets, it is a matter of individual judgment – and of considerable

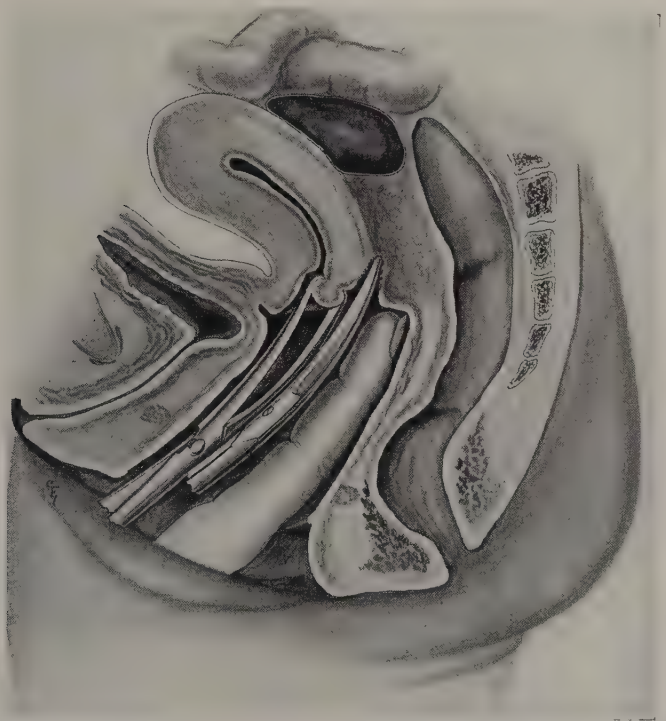


Fig. 5715.—Evacuation of a More or Less High-placed Intrapelvic Abscess Through a Posterior Colpoperitoneotomy Incision; – The left index-finger, with nail backward, is progressing *pari-passu* with the scissor ends – the back of the finger pushing the rectum out of the way – and the concavity of the scissors following the posterior uterine wall. Considerable tissue may have to be traversed before reaching the abscess – and this is accomplished by successive snips.

practical importance, of course, not to break through limiting walls, into the uninfected portion of the peritoneal cavity, or into a viscus.

Nitrous oxid anesthesia usually suffices where analgesia is not sufficient – unless a more prolonged dissection is necessary, when ether and oxygen may be employed.

It is to be remembered that in the mere evacuation of pus by the vaginal route ample cause for future trouble may be left behind in such conditions as adherent tubes, ovaries, and the like, which might not have been relieved, not only of the suppurative feature, but of future possible trouble, by a more radical intra-abdominal procedure. In the intra-abdominal operation, however, the tubes and ovaries are more apt to be sacrificed than in the case in

the operating via the vaginal route – which is a matter of considerable importance to the young, as compared with the older woman.

Blunt-pointed scissors should especially be used in operating upon laterally placed abscesses – as the ureters and vessels are thereby less apt to be injured.

Abscess cavities are usually not irrigated – although if there were absolute certainty that the general peritoneal cavity be strongly shut off, there would be no objection in doing so, with some non-toxic solution, provided no distention of the cavity be thereby produced. (It is to be remembered that an abscess cavity, one wall of which is made up of adherent coils of intestine, may be somewhat weakened, temporarily, as to this wall, by the collapse of the surroundings upon the evacuation of the pus.)

The opening in the posterior vaginal fornix should be large enough to maintain drainage, usually from 2/5 to 3.2 cm. (1–1½ inch) in length, and somewhat curved around the posterior lip of the cervix. Sometimes the margins of the peritoneum or of the abscess wall are sutured to the margins of the incised vagina.

The advantages of vaginal drainage of intra-abdominal abscesses over abdominal operation for their relief, as given by Kelly, are the following: – less mortality – preservation of the infected structures and their functions, especially tubes and ovaries, in a larger number of cases – less danger of complications from adherent intestines – less suffering and easier convalescence – avoidance of possible postoperative hernia – possibility of an intravaginal operation, when an intra-abdominal one might be contraindicated.

In exploratory puncture the greater the uncertainty as to the presence of pus, or its position, the smaller should be the caliber of the needle.

Kelly suggests making the initial opening into Douglas' culdesac by means of the red point of a galvanocautery knife.

If, inadvertently, it be found that in seeking to investigate, or to break into secondary abscess cavities, the free peritoneal cavity be entered, then one should carefully make the freeing and cleansing of the pus cavities as thorough as possible – after which gauze should be loosely packed into the site of the pus cavity, or cavities, with its end brought out into the vagina – after carefully wiping out the cavity with gauze. Fortunately such a mishap does not end seriously in the majority of cases.

In seeking to open a secondary abscess with the fingers, after incising the first one, and especially carrying on the manipulation upon either side of the uterus, as in opening up one or both pus tubes, guidance to it, and help in accomplishing the opening of this is accomplished by counterpressure upon the abdomen with the opposite hand. It is especially under such circumstances as these that one must guard against opening a coil of small intestine rather than a pus-filled tube – a serious error – and an inevitable fecal fistula – if nothing worse.

Hunner's technic in opening unilateral or bilateral abscesses situated low, on either side, in contact with the broad ligament, is to incise the vaginal vault and then to digitally protrude the tissues upward, while making a blunt dissection upward, toward the broad ligaments, until the finger reaches the abscess, which it ruptures – without having invaded the peritoneal cavity.

Drainage is best accomplished by loosely packed gauze, carried into the site of the abscess, and brought out into the vagina – where it remains for a few days to a week, or ten days, according to circumstances. If indicated, the gauze drain (which, it must be understood, is literally a gauze drain rather than a gauze packing (which would be "corking" of the cavity), may be changed – and, at such secondary changes, irrigation without distention, may be safely

performed, and is usually indicated. Drainage is discontinued when it is no longer considered necessary, although a prematurely closed opening may require some secondary dilatation.

In dealing with an abscess in the extraperitoneal areolar tissue, at the base of one, or both broad ligaments, such as is apt to follow confinement, an incision is made in the dome of one of the lateral fornices, after the abscess has been given time to well demonstrate its presence, after which progress toward the abscess is made by blunt dissection – as one is due to encounter the ureters and more considerable blood-vessels in these directions.

Some Operators prefer rubber tube drains, variously improvised out of ordinary rubber tubing. The squarely cut ends of these are capable, by continued pressure, to cut into a coil of intestine. If a rubber drain is to be used, therefore, it should be in the form of an enlarged mushroom drain – or the velvet-eyed end of a small rectal or stomach tube, additionally fenestrated. The mushroom drain (specially made of a larger size than the one made for the bladder) will remain *in situ* without an anchorage suture.

If hemorrhage be troublesome, in completing the operation, the rubber drain and gauze may be conjointly employed – so that gauze may be somewhat snugly packed around that part of the resistant tube which passes through the bleeding tissues – and one or the other withdrawn after temporary usage, and the cessation of bleeding.

While the majority of Surgeons prefer gauze drainage not too tightly packed, some decry its usage, as being inadequate to maintain sufficient patulousness of the vaginal opening for adequate, prolonged drainage – in which there is, undoubtedly, much practical bearing.

Drainage may, exceptionally, have to be maintained for several weeks – sometimes from two to six – but in such cases the patient will generally be able to be up and about. It is difficult to keep a drain conducted into the vagina more than two or three days without removal, irrigation, and reintroduction.

Some Operators do not irrigate the site of the intrapelvic suppuration, even in the secondary dressings.

It will sometimes happen, on completing the incision and dissection, in quest of an intrapelvic abscess, that a free pus tube will be encountered by the finger – that is, one not in continuous contact with the route of dissection, and not shut off from the general peritoneal cavity by adhesions. Two courses are open. One may leave the vaginal incision open (packing the vaginal wound lightly with gauze) – place the patient in the dorsal decubitus, open the abdomen, and remove the tube without soiling the peritoneal cavity – or, this being contraindicated, or impossible, he may still, under direct observation and touch, insert a rubber tube into the incised pus tube, and conduct it out of the already made vaginal opening, with as little soiling of the peritoneal cavity as possible, and with ample provision for drainage. Or, without considering the invasion of the pelvis from the abdomen, one may, as is the usual counsel, undertake to incise the pus tube, and then introduce a rubber tube directly into the lumen of the pus tube (not simply up against it, or in its direction), engaging one of the drains in the pus tube, and bringing the opposite end out of the vaginal opening, and anchoring it there with a stitch.

Broad ligament abscesses should be opened, as already indicated, without opening into the general peritoneal cavity – by blunt dissection, after incising the vaginal vault, upward and outward, between the layers of the broad ligament – avoiding the uterine artery and the ureter.

CYSTOCELE, RECTOCELE, AND PROLAPSUS UTERI, IN GENERAL

Cystocele is characterized by the prolapse of the anterior vaginal wall, together with the corresponding aspect of the posterior vesical wall, which, because of its connection, it drags down along with it.

Fig. 5716.—Incomplete Uterine Prolapse, with Accompanying Cystocele and Rectocele.

Rectocele is characterized by the prolapse of the posterior vaginal wall, together with the corresponding aspect of the anterior rectal wall, which, because of the intervaginorectal attachment, is dragged down with it.

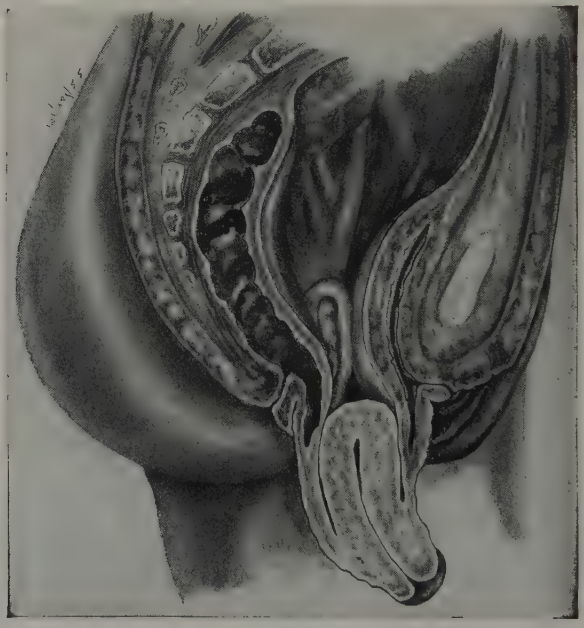


Fig. 5717.—Complete Uterine Prolapse, with Accompanying Cystocele and Rectocele.

Prolapse of the uterus, descensus uteri, procidentia uteri are all terms expressive of the downward displacement of the uterus from its more normal

position – descensus sometimes being used in connection with the least marked, and procidentia, with the most marked condition. In incomplete prolapse the uterus still remains within the confines of the vagina, though the os uteri may rest at the vaginal outlet (Fig. 5716). In complete prolapse the uterus has more or less completely escaped from the vagina – dragging the vaginal walls with it (Fig. 5717). In the most complete types of prolapse the uterus, after making its exit in the axis of the vagina, will often come to lie with its major axis at some angle with the normal vaginal axis.

Cystocele may occur independently as the result of a relaxed anterior vaginal wall – but is usually associated with laceration and relaxation of the perineal floor – and the most marked cases of cystocele are encountered with complete uterine prolapse.

Rectocele is almost always due to laceration and relaxation of the vaginoperineal body – the most marked degree occurring here, also, in connection with associated complete prolapse of the uterus. The operative repair of rectocele thus caused has been covered in the operations upon the vaginoperineal body (v. pp. 154–229).

Prolapse of the uterus has called forth much discussion, but, briefly summarized, is caused by the relaxation or laceration, or both, of the more movable extraperitoneal, pelvic fibromuscular structures, upon, or in relationship with the more fixed structures.

The most pronounced degrees of cystocele and of rectocele are, not unnaturally, encountered in connection with coexistent complete prolapse of the uterus.

Operations for simple, independent cystocele and rectocele – and for uterine prolapse – will be now considered.

OPERATIONS FOR CYSTOCELE

Operations for independently occurring cystocele are here understood – or operations for the cystocele part of compound conditions, when more than one condition is present, and each demands operation. In some circumstances the cystocele is but a secondary cause, following such major condition, where, when the major condition has been met by operation, the secondary condition disappears – as when a cystocele is relieved by operation for extensive laceration and relaxation of the vaginoperineal body – or by successful operation for complete uterine prolapse.

Operation for Cystocele by Oval Denudation of the Anterior Vaginal Wall, Followed by Suture of the Plane of Uteropubic Fascia and Vaginal Wall.—The patient lies in the dorsal gynecologic posture, with posterior weighted perineal tractor in position, and the vaginal walls laterally retracted. The cervix is seized with vulsellum forceps and drawn downward – while the vaginal mucosa is caught in the median line, about 1.3 cm. ($\frac{1}{2}$ inch) behind the meatus, and drawn forward. Steadying the anterior vaginal wall between the grip of these two vulsella, by dissecting, or other form of special forceps, an oval area is first outlined, commensurate with the degree of cystocelic bulge present in the particular case – and is then excised, consisting of the vaginal wall, down to the connective-tissue plane (Fig. 5718). It should include as great a length and width of the anterior vaginal wall as may be indicated. It is usually unnecessary to draw the uterus outside of the vagina as well as undesirable (if no prolapse be already present) to accomplish this denudation. The freeing of the oval flap is begun, following the circumscribing knife incision, by curved scissors, but may be then completed by a gauze-covered finger. The bladder should be carefully guarded – and if encountered

in the connective-tissue plane, should be mobilized and pushed upward. The bladder is usually separated as high as the internal os.

An important part of the operation consists in pleating together folds of the resistant uteropubic fascia by one or more tiers of buried chromic catgut sutures _ the width of infolding and overlapping of this fascial plane being dependent upon the degree of cystocele. Such infolding sutures are shown in Fig. 5719, a. When these are tied the anterior vaginal wall is considerably narrowed _ the bladder being thereby buttressed. Finally, the margins of the anterior incised vaginal wall are brought together (Fig. 5720) _ remembering, though, that it is the buried suturing of the fascial plane which is the chief efficient agency in the repair. No drainage is, ordinarily, required.

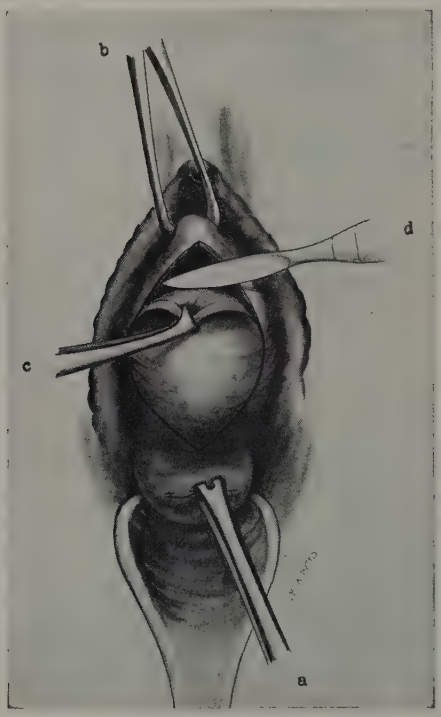


Fig. 5718.—Operation for Cystocele by Oval Denudation of the Anterior Vaginal Wall, Followed by Suture of the Plane of Uteropubic Fascia and Vaginal Wall _ I; _ Excising the oval area of the anterior vaginal wall.

Fig. 5719.—The Same _ II; _ The redundant deeper uteropubic fascial plane is being folded in, or together, by buried chromic catgut sutures _ and the margins of the vaginal wall, by interrupted sutures.

Operation for Cystocele by Circular Denudation and Suture of the Anterior Vaginal Wall _ Stoltz's Technic.—This purse-string form of operation is one of the simplest types of procedure, and often efficient in simple cases. Its general features are seen in Fig. 5721. Calculation for the circular denudation is made by choosing the two most lateral points _ the anterior, just posterior to the meatus _ and the posterior, anterior to the cervix. By grasping these, in pairs, with forceps, and seeing if they can be approximated, one is enabled to determine whether the calculation have been well made. The area of anterior vaginal wall, represented by this circle, is then excised, down to the connective-tissue plane _ carefully avoiding damage to the blad-

der. A sound introduced into the bladder may be employed during the separation of the circle of vaginal wall, to protect the bladder by outlining its position. A stout silk suture is then carried, in and out, through the outer layers of the vaginal wall, just to the outer line of the circular incision _ after which the two limbs of the suture are drawn together, puckering up the cut margin, very much as a draw-string draws together the mouth of a bag, and the ends are then tied together.

Operation for Cystocele by Buried Circular Purse-string Suture of the Exposed Fascial Plane, Followed by Closure of the Vaginal Wall _ Gersuny-Saenger.—The anterior vaginal wall is split medially, from a short distance below the meatus, down toward the cervix, which is drawn forward. The

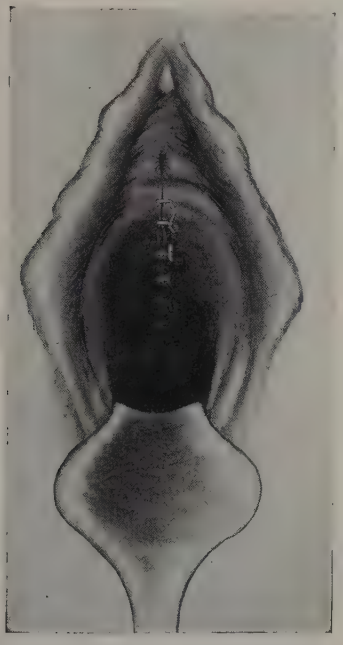


Fig. 5720.—The Same _ III; _ The finally sutured wound.

Fig. 5721.—Operation for Cystocele by Circular Denudation and Suture of the Anterior Vaginal Wall _ Stolt'z Technic; _ The circular area of the anterior wall has been excised, and the purse-string suture placed in the sound vaginal wall, immediately adjacent to the section.

two vaginal flaps are dissected outward in the connective-tissue plane _ and retracted well to either side _ exposing a sufficiently broad area to enable the placing of a large enough circular suture. (It would seem that it would add to the efficiency of the technic if a strip were cut from the median border of these two vaginal flaps, so that when the narrower flaps were sutured together additional compression of this region would be exercised by them.) One or two planes of circular purse-string suture of chromic catgut are then placed _ each taking a good hold of the fascial plane. In Fig. 5722 the first one of such sutures is seen tied, and the second suture placed, ready to be tied. Finally, the margins of the vaginal flaps are brought together by interrupted or continuous suture.

Operation for Cystocele by Shield-shaped Anterior Colporrhaphy — Reynold.—The patient is placed in Sims' position — and the posterior vaginal wall well retracted. An area, the shape of a shield, is denuded from the anterior wall of the vagina — the denudation being accomplished in very much the same manner as that practised upon the posterior vaginal wall in the various perineorrhaphy operations (Fig. 5723). The calculation for the size of the area to be removed must be planned with reference to the amount of narrowing and shortening of the anterior vaginal wall which it is desired to bring about.

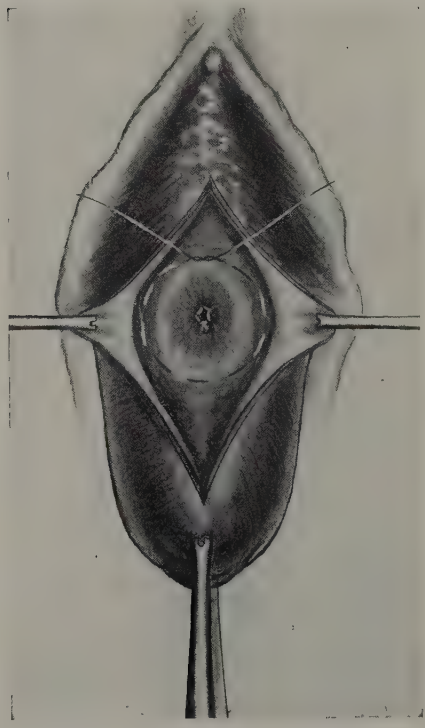


Fig. 5722.—Operation for Cystocele by Circular Purse-string Suture of the Exposed Fascial Plane, Followed by Closure of the Vaginal Wall — Gersuny-Saenger; — The anterior vaginal wall has been medially split and each vaginal flap dissected outward — after which the first circular tier of purse-string suture has been placed and tied — and a second buried purse-string suture is being placed, ready to tie — after which the margins of the vaginal flaps will be sutured.

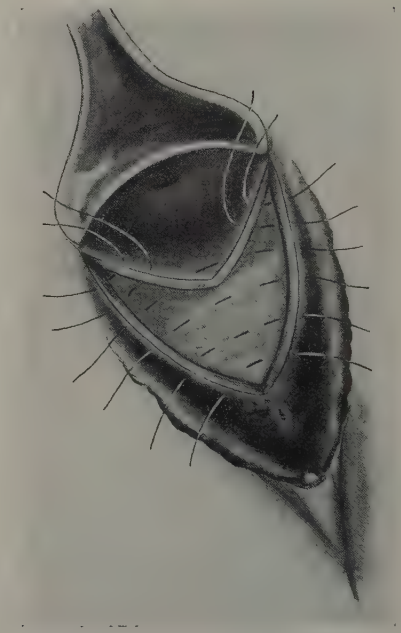


Fig. 5723.—Operation for Cystocele by Shield-shaped Excision of the Anterior Vaginal Wall, Followed by Anterior Colporrhaphy; — The shield-shaped area is seen excised — and sutures are seen placed, ready to be tied.

The same precautions as to the careful avoidance of injury to the bladder obtains as in other corresponding operations. The parts, when sutured, assume the form of a Y — the opposite aspects of the upper limbs coming together — and the sides of the lower portion of the shield coming together in the median line.

Operation for Cystocele by Double Areas of Denudation and Suture — McKay.—A posterior retractor is introduced, the cervix drawn downward with volsellum forceps — and two areas of vaginal wall planned for excision — their sizes dependent upon the degree of cystocele. The larger area is

Fig. 5724.—Operation for Cystocele by Double Areas of Denudation and Suture.—McKay.—I:—a, Larger, lozenge-shaped, and smaller, elliptic area of anterior vaginal wall are seen excised.—and sutures placed, ready to be tied.

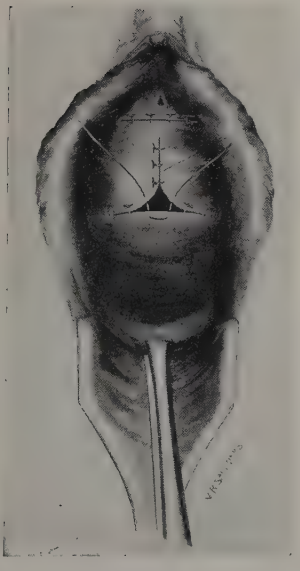


Fig. 5725.—The Same.—II;.—The suturing of the denuded areas

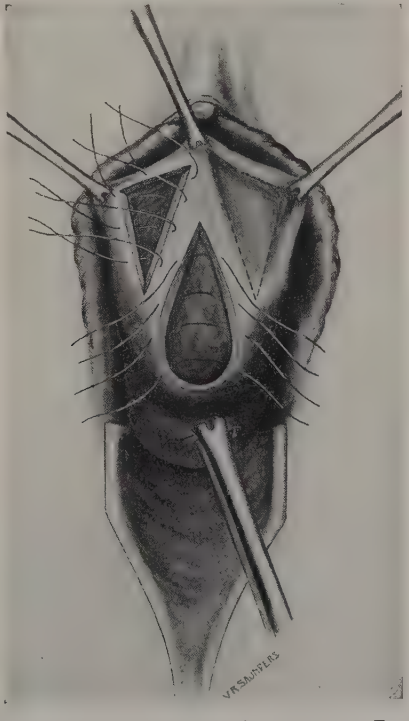


Fig. 5726.—Operation for Cystocele by Triple Areas of Denudation and Suture.—Hirst;.—Two lateral triangular areas of anterior vaginal wall, and a median, oval one are being excised.

lozenge shaped _ and is outlined with small vulsella while the incision is being made and the vaginal wall excised _ as shown at **a, a,** Fig. 5724. The denudation is accomplished by curved scissors. The major area is sutured in such manner as to form a transverse and an upper median line of sutures. As the margins are drawn together an unapproximated triangular center is left _ which is finally closed by a suture placed in the manner shown in Fig. 5725. Above the major area of denudation a smaller, oval area is denuded _ the margins of which are sutured so as to form a transverse scar (v. Figs. 5724 and 5725).

Operation for Cystocele by Triple Areas of Denudation and Suture _ Hirst.—The principle here involved is the same as in some of the pre-

Fig. 5727.—Operation for Cystocele by Partial Excision of the Vaginal Wall and Reefing the Uteropubic Fascia, Followed by Suturing of the Vaginal Margins _ I; _ Median incision over the prominent anterior vaginal wall, reinforced, if necessary by a transverse incision over the cervix.

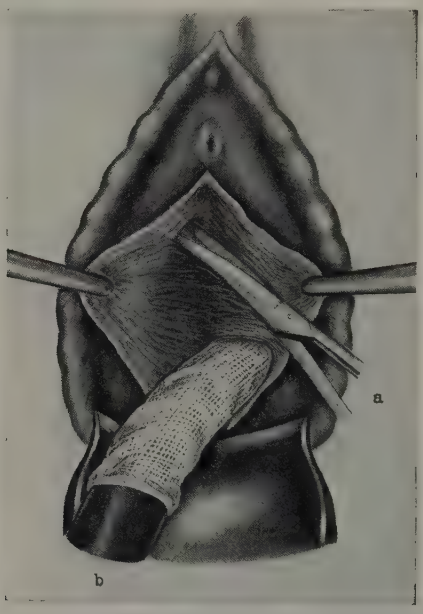


Fig. 5728.—The Same _ II; _ Freeing the vaginal flaps: **a,** By sharp _ and **b,** by blunt dissection.

ceding methods _ namely, that of lessening the anterior vaginal wall _ the difference being, mainly, in the position, shape, and number of the areas denuded. Two upper, lateral triangular tracts of vaginal wall are excised (Fig. 5726) and a lower, median, oval one _ after which the opposite margins of each area are brought together by sutures which cross each wound from side to side.

Operation for Cystocele by Partial Excision of the Vaginal Wall and Reefing the Uteropubic Fascia, Followed by Suturing of the Vaginal Margins.—This method of procedure affords a satisfactory means of lessening the vaginal wall and of buttressing up the bladder, especially in more pronounced cases of cystocele. The posterior vaginal wall is retracted _ the cervix drawn forward _ and a median incision made down the anterior vaginal

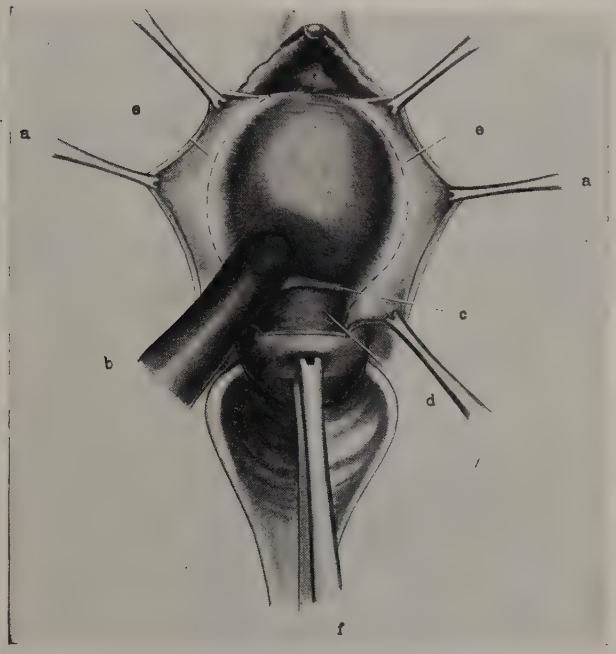


Fig. 5729.—The Same – III; – The vaginal flaps have been separated laterally – and the bladder partially mobilized from the cervico-uterine wall and pushed upward, b. The redundant portions of the vaginal wall to be excised are shown at e, e.

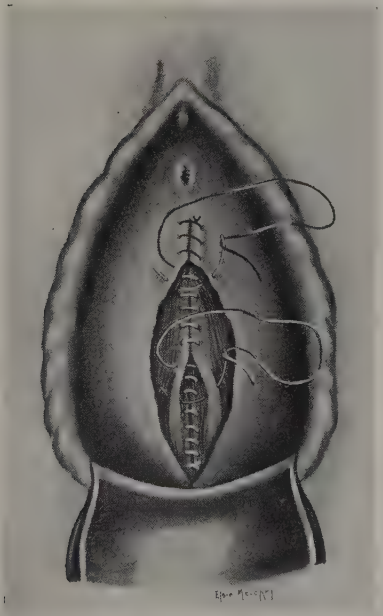


Fig. 5730.—The Same – IV; – Buried sutures reefing the redundant musculofascial plane in double tier – and others closing the margins of the vaginal wound.

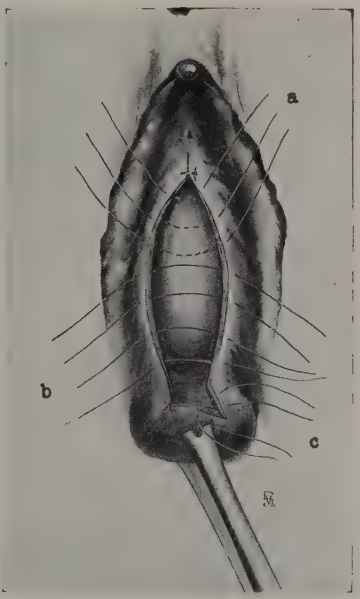


Fig. 5731.—The Same – V; – The closure of the margins of the shortened vaginal flaps. In this illustration the plaiting sutures of Fig. 5730 are not shown.

wall, from as near the meatus as may be indicated by the size of the cystocele, onto the cervix (Fig. 5727) A limited transverse incision may be added at the bottom of the vertical incision over the cervix. The vaginal wall is then dissected outward on either side, as two lateral flaps, by combined sharp and blunt dissection (Fig. 5728). The more or less prominently bulging bladder is recognized early in the procedure, and, henceforth, carefully safeguarded. In question of doubt, its lower limit may be recognized by a sound introduced through the urethra. It is partially mobilized from the cervico-uterine wall, and displaced upward. The excess of anterior vaginal wall is excised by cutting away a part of each lateral vaginal flap (Fig. 5729).

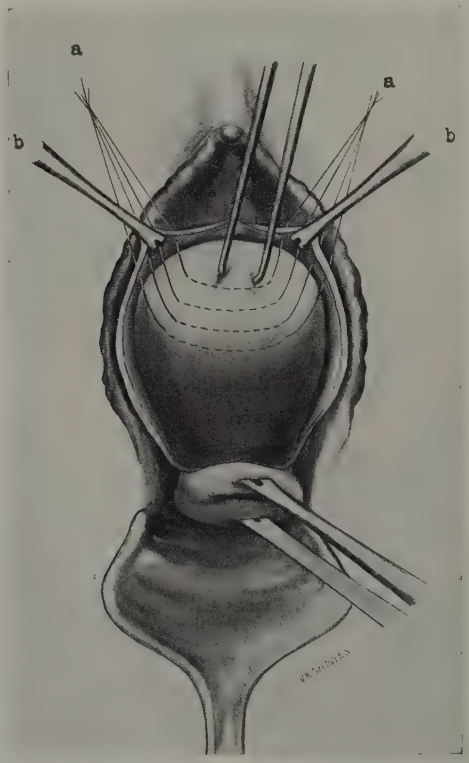


Fig. 5732.—Operation for Cystocele by Partial Excision of the Vaginal Wall and Reefing the Uteropubic Fascia _ Accompanied by Vaginofixation _ and Followed by Suturing the Vaginal Margins; _ The placing of the uterovaginal fixation sutures are here alone shown _ the rest of the technic being as in the preceding operation.

As is characteristic of these operations, a specially important part of the technic consists in removing the redundant portion of the vaginal wall, and in plaiting, or reefing the underlying and abnormally bulged-out uteropubic plane of fascia _ as is seen being accomplished in Fig. 5730.

Finally, the margins of the vaginal flaps, from which the redundancy has been excised, are sutured together (Fig. 5731).

Operation for Cystocele by Partial Excision of the Vaginal Wall and Reefing the Uteropubic Fascia _ Accompanied by Vaginofixation _ and Followed by Suturing the Vaginal Margins.—If in addition to the technic just described _ which would be carried out in the same manner _ it

be desired to add vaginofixation as a reinforcing feature, this part of the procedure is the same as in performing vaginofixation for retroversion of the uterus. In Fig. 5732 are seen the fixation sutures, buried in the anterior wall of the uterus, and their ends passing through the margins of the vaginal flaps, ready to be tied after the margins of the rest of the vaginal flaps have been sutured together.

OPERATIONS FOR RECTOCELE

Rectocele almost always occurs in connection with laceration and relaxation of the vaginoperineal body (v. Cystocele, Rectocele, and Prolapsus Uteri, in General, p. 392) _ and the operative procedures for this combination of conditions have been very fully covered under the Operations Upon the

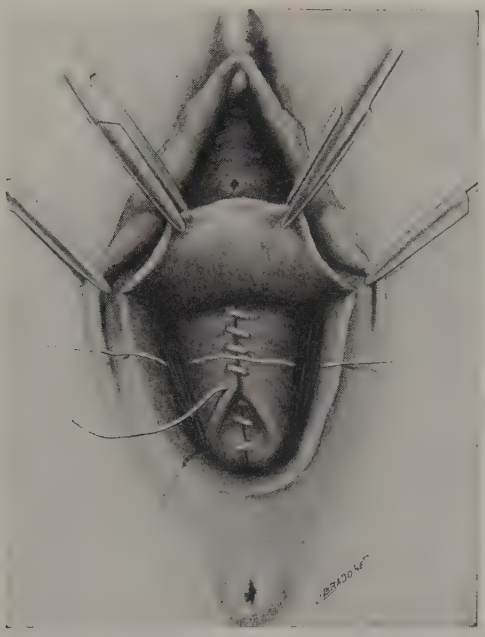


Fig. 5733.—Operation for Marked Rectocele Not Accompanied by Vaginoperineal Laceration _ by Infolding the Rectal Wall by Non-penetrating Sutures, and Reinforcing This by Suturing, Over it, the Levatores Ani and Fascial Structures _ Through Flap-splitting Exposure.

Vaginoperineal Region (v. pp. 154–229). Also see Operations for Cystocele (p. 393).

The only additional consideration to be given here will be with reference to one or two technical prodecures, applicable especially in well-marked conditions of rectocele, irrespectively of its cause or association.

Such a condition as here referred to is represented by the prolpase of the posterior vaginal wall, containing within its prolapsed portion a pouch of anterior rectal wall _ as may be caused by the laceration (or severe stretching) of the levatores ani muscles, the rectovesical fascial plane, and the triangular ligament.

Operation for Marked Rectocele by Infolding the Rectal Wall by Non-penetrating Sutures, and Reinforcing this by Suturing Over it the Levatores Ani and Fascial Structures.—The method of exposure is

usually either by one of the flap-splitting (v. p. 191) or by one of the denudation technics (v. p. 209). The bulging rectum, whose anterior wall has become pouched and redundant, is carefully exposed over the area of the protruding portion of the anterior wall. According to the degree of redundancy of this wall one or two tiers of buried sutures of chromic catgut are placed through the outer coat _ carefully avoiding penetration of the mucosal coat _ in such manner as to cause a single tier of longitudinal infolding, or two superimposed tiers of longitudinal infoldings of the anterior rectal wall upon itself (Fig. 5733). The placing of these sutures, which had better be interrupted rather than continuous, is aided by depressing the central aspect of the bulging wall by means of a sound held against the presenting aspect of the wall.

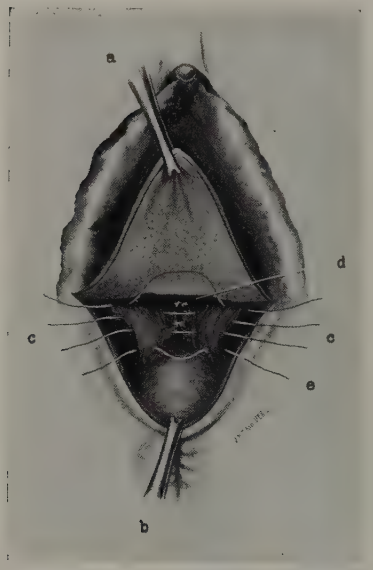


Fig. 5734.—The Same _ II; _ Reinforcing the anterior rectal wall (which is usually infolded by one or more tiers of sutures) by suturing the opposite aspects of the levatores ani and fascial structures over the infolded bowel: _ **a,** The split and retracted vaginoperineal flap; _ **b,** the infolded anterior rectal wall; _ **d,** sutures approximating the deeper aspects of the levatores ani; _ **c, e,** sutures approximating the more superficial aspects of the levatores ani and the fascial structures.

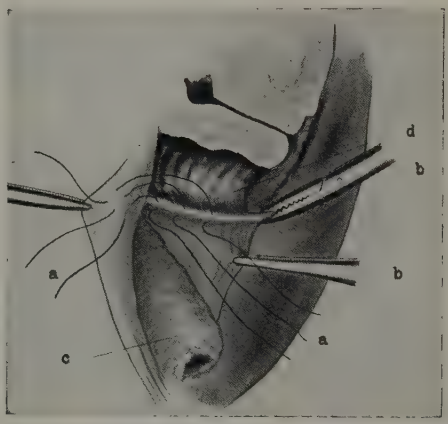


Fig. 5735.—The Same, in semisectional view: _ **a, a,** Sutures placed to approximate the opposite denuded levatores ani over the usually infolded anterior rectal wall; _ **b, b,** tractors tensing the structures of the left side during the placing of the sutures; _ **c,** the rectum; _ **d,** the vagina. The vaginoperineal flap is not here shown.

And the safety against penetration of the entire thickness of the wall is additionally secured if the sutures are placed while the Surgeon's left index-finger is within the rectum at the time _ changing the left glove upon its withdrawal.

Then, to reinforce this infolding, the levatores ani and the fascial plane are sutured together over the infolded rectal wall by means of interrupted buried chromic catgut stitches (Fig. 5734), the sutures taking a substantial hold upon the more resistant structures, thereby restoring the vaginorectal septum. The technic is seen, semi-sectionally, in Fig. 5735.

Finally, the closure of the flap split, or denuded vaginal floor and perineum is accomplished in the usual manner of these operations _ so that the entire

region is substantially built up, and the vaginorectal septum greatly increased in thickness and strength by the lateral drawing together of the parts in the median line. The parts, in conclusion, present the appearance of a radical perineorrhaphy _ whether the condition, originally, have been laceration, simple relaxation, or, as is more usual, the two combined. The combined denudation operation for laceration and rectocele is shown in Fig. 5736.

Operation for Marked Rectocele by Partial Excision of the Pouch of the Anterior Rectal Wall, Exposed Through the Floor of the Vagina and Protruded Through the Anus _ Noble.—The anterior rectal wall,

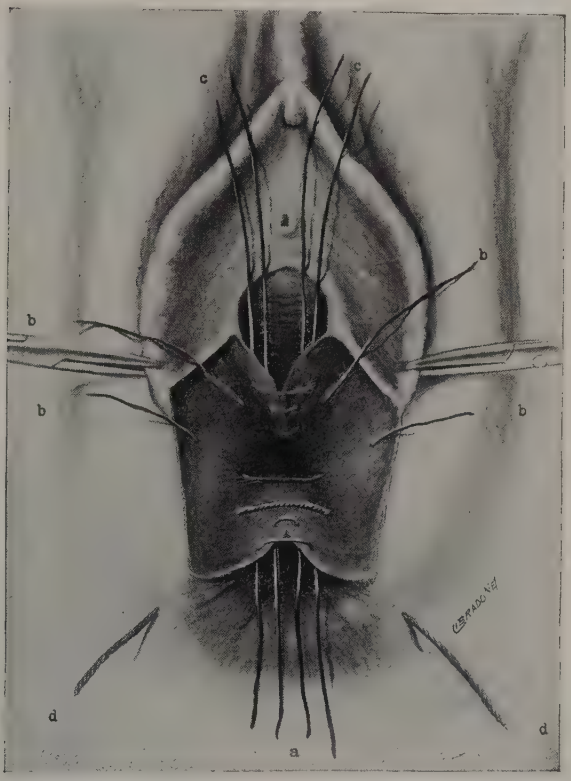


Fig. 5736.—Operation for Marked Rectocele, Accompanied by Complete Vaginoperineal Laceration, by Infolding the Anterior Rectal Wall and Reinforcing This by Suturing Over it the Levatores Ani and Fascial Structures _ Through Denudation Exposure: _ **a,** The infolded rectal wall; _ **b,** the approximation of the levatores ani and pelvic fascia over the infolded bowel; _ **c, c,** sutures for closing the vaginal floor; _ **d,** heavy, lowermost perineal suture.

bulging through the floor of the vagina, whether because of relaxation or laceration of the vaginoperineal structures, or both, is exposed by the method of election _ usually some flap-splitting or denudation type of procedure. The patient is thoroughly prepared for the vagino-perineo-rectal operation. A finger, inserted through the vaginoperineal wound, is brought into contact with the outer aspect of the pouched anterior rectal wall, and, pushing it downward and forward, everts it through the anus _ the eversion being aided by grasping the presenting part with forceps as it is pushed through the anal orifice (Fig. 5737). The neck of the redundant pouch is then clamped _ the clamps running with the longitudinal face of the perineum, or transversely, as may seem

Fig. 5737.—Operation for Marked Rectocele by Partial Excision of the Pouch of the Anterior Rectal Wall, Exposed Through the Floor of the Vagina, and Protruded Through the Anus _ Noble _ I; _ The index-finger is passed through the denudation in the vaginal floor, and the rectocele is everted through the anus, by the finger, aided by the grasp of forceps.

Fig. 5738.—The Same _ II; _ The neck of the rectocele sac is seized transversely by clamps, and excised between the clamps and the face of the perineum.

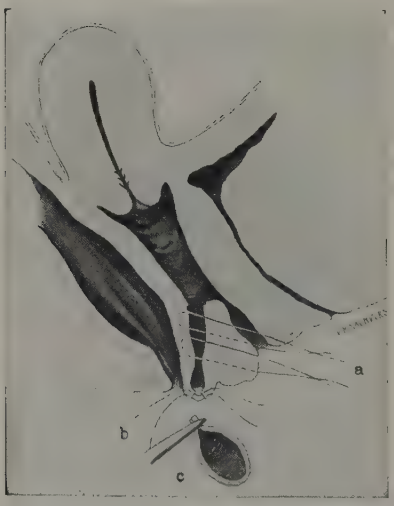


Fig. 5739.—The Same _ III; _ The cut margins formed, posteriorly, by the anterior rectal wall, and, anteriorly, by the margin of perineum, are brought together by deep and superficial sutures, b, after which the opened vaginoperineal septum is closed by sutures in the ordinary manner of a perineorrhaphy.

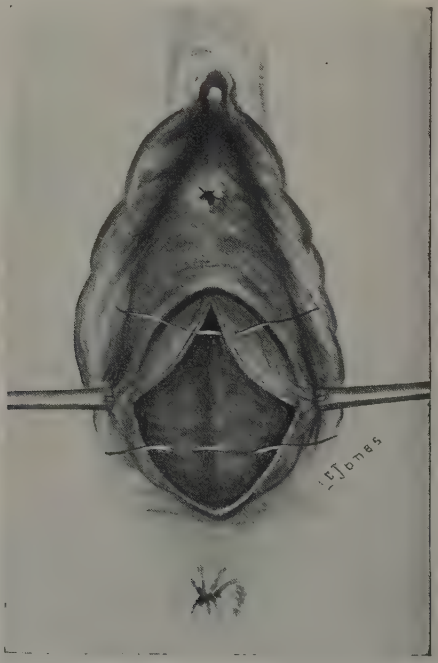


Fig. 5740.—Operation for a Minor Grade of Rectocele by Simple Vaginoperineorrhaphy; _ The deeper pelvic structures are being brought together over the non-infolded rectal wall by buried sutures _ while the vaginoperineal margins are being approximated in the ordinary manner.

indicated (Fig. 5738). The rectal pouch is then excised either proximally or distally to the clamps _ but, if in the former manner, provision must be made in advance to guard against the inconvenient retraction of the parts. The free margins of the rectal wall are then brought together by a double tier of non-penetrating sutures, the buried tier being of chromic catgut (Fig. 5739), after which the vaginoperineal floor is closed in the usual manner.

Operations for Minor Grades of Rectocele by Simple Types of Vaginoperineorrhaphy.—In Fig. 5740 is seen a simple form of lozenge-shaped vaginoperineal denudation _ following which the deeper pelvic structures are sutured over the prominent anterior rectal wall without any special infolding of the wall of the bowel by suturing _ and then the margins of the denuded area are brought together in the ordinary manner.

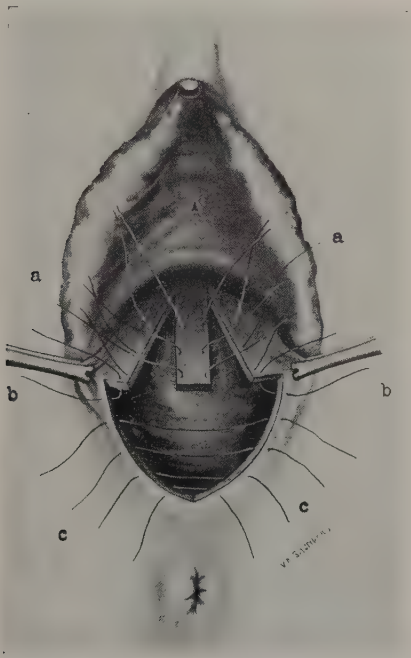


Fig. 5741.—Operation for a Minor Grade of Rectocele by an Irregular Type of Vaginoperineal Denudation; _ The vaginal floor is being closed by the sutures **a, a** _ the perineal face by the sutures **c, c** _ and the junction of the two by the sutures **b, b**

In Fig. 5741 a somewhat more complex form of vaginoperineal denudation is accomplished _ the object being to remove so much of the vaginoperineal mucocutaneous aspect that when the remaining margins are brought together there will be a considerable narrowing of both the floor of the vagina, and also restoration of the probable lacerated perineal wall, by approximation of its diverging boundaries to the median line.

OPERATIONS FOR RETRODISPLACEMENT OF THE UTERUS BY THE VAGINAL ROUTE

Taken as a class, the operations for rectodisplacement of the uterus, performed through the vaginal route, in the opinion of the Author, rank third _ after, first, those by the abdominal route (v. Index) _ and next, those by the inguinal route (v. p. 508). Mechanically, they accomplish less, in that the

uterus cannot be satisfactorily drawn upward and forward – and, along with other procedures by the vaginal route, afford a less satisfactory opportunity for making, simultaneously, a comprehensive investigation of the general condition of the female organs, and, probably, the better correction of such primary and secondary conditions as may be encountered.

Operation for Retrodisplacement of the Uterus, Incompatible with Safe Pregnancy, by Vaginofixation of the Uterus.—Through an anterior colpoperitoneotomy the anterior wall of the uterus is sutured directly to the anterior vaginal wall. Where, at best, if the fixation is made extensive and strong enough to accomplish material help as to the retrodisplacement, it usually

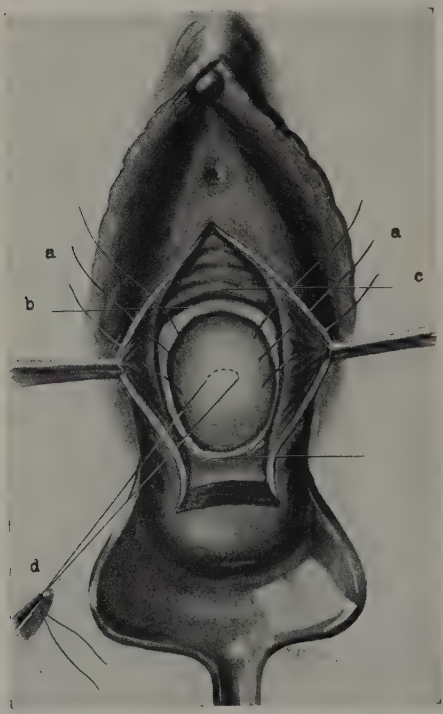


Fig. 5742.—Operation for Retrodisplacement of the Uterus Incompatible with Safe Pregnancy by Vaginofixation of the Uterus – I; – The vaginal flaps are being held apart by clamps: **d,** Temporary tractor suture holding the body of the uterus forward; – **c,** upwardly displaced bladder; – **b,** margin of the incised peritoneum pressed backward, around the presenting portion of the uterus; – **a, a,** uterine fixation sutures, passing into the anterior wall of the uterus, and out through the margins of the vaginal flaps, *without* penetrating the peritoneum, so that the uterus will be held directly against the raw vaginal flaps (the distinguishing feature of the fixation operation).

interferes with pregnancy – and where, if the union is lax enough not to interfere with pregnancy, it is usually of little use in counteracting the retrodisplacement (and is, in such cases, practically a suspension of the uterus to the vesico-uterine peritoneum).

The exposure is made by an inverted T-shaped incision (Fig. 5742). The bladder is recognized at an early stage in the procedure, freed from the anterior cervico-uterine junction, and pushed upward. The peritoneum is opened in the ordinary course of the anterior colpoperitoneotomy – it being immaterial here whether the peritoneal pouch itself be incised medially or transversely, as its margins are not to be sutured. The fundus of the uterus is held forward

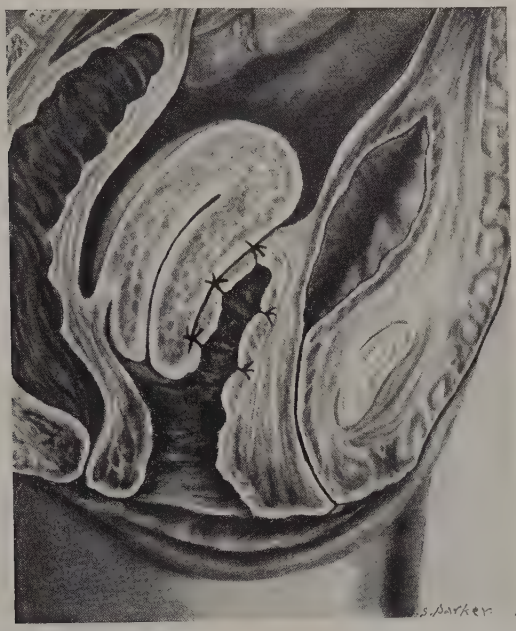


Fig. 5743.—The Same – II; – Sectional view of the completed vaginofixation operation.

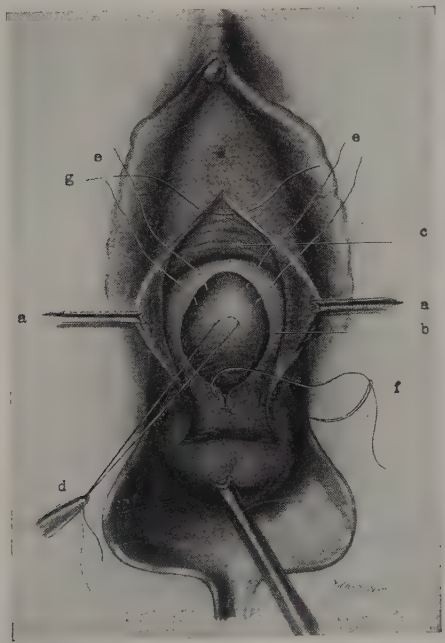


Fig. 5744.—Operation for Retrodisplacement of the Uterus Compatible with Pregnancy by Vaginosuspension of the Uterus – Method I: – **a, a,** Tractors of the margins of the vaginal incision; – **b,** margin of the incised peritoneum; – **c,** upwardly displaced bladder; – **d,** temporary thread tractor holding the body of the uterus forward; – **e, e,** uterine suspension sutures, passing through the margins of the peritoneum only (the characteristic feature of this method of suspension); – **f,** continuous suture uniting the margins of the peritoneum; – **g,** interrupted sutures, uniting the margins of the vaginal incision.

by a temporary stout silk tractor, placed with a curved needle. While so held, three fairly stout chromic catgut sutures are carried transversely into the anterior uterine wall – through an exposure of the anterior wall from which the margins of the incised peritoneum have been pressed away. The free ends of these three fixation sutures are then carried through the free margins of the vaginal flaps (being conveniently accomplished by a Reverdin needle) – being certain to see, in the passage, that the margins of the incised peritoneum will all lie outside of the fixation sutures, and that these sutures will pass through the vaginal flaps far enough from their margins to enter the flaps opposite the sites from which they emerge from the anterior uterine wall. By this technic

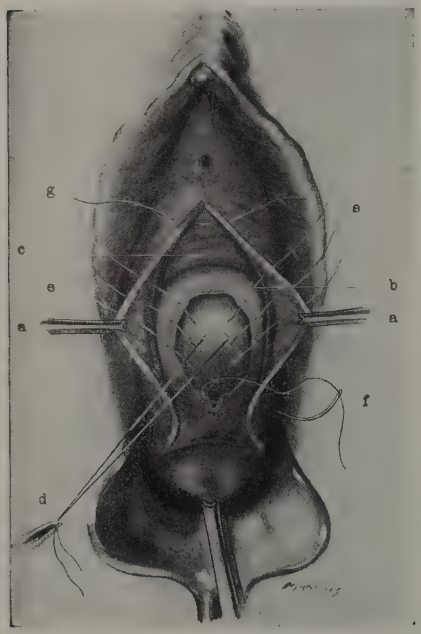


Fig. 5745.—Operation for Retrodisplacement of the Uterus, Compatible with Pregnancy, by Vaginosuspension of the Uterus – Method II: – **a, b, c, d** and **f, g,** as in the preceding figure; – **e, e,** uterine suspension sutures, passing through both the margins of the incised peritoneum and the margins of the vaginal flaps (the characteristic feature of this method of suspension).

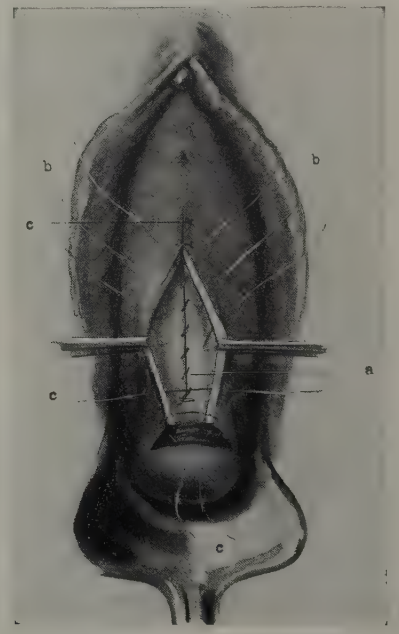


Fig. 5746.—The Final Closing of the Margins of the Incised Peritoneum and of the Vaginal Flaps in Both Methods I and II.

the anterior wall of the uterine fundus is brought into direct contact with the vaginal wall, no peritoneum intervening. The margins of the vaginal incision are then closed by separate sutures. A sectional view of the completed operation of vaginofixation is seen in Fig. 5743. Vaginal fixation of the uterus, just described, differs from vaginal suspension of the uterus about to be described in the details covered in the following paragraph.

In Vaginal Suspension of the Uterus (an often used, though not strictly correct expression, as the uterus, here, is not sutured directly to bared vaginal tissues) the bond of union between the uterus and the peritoneally covered pelvic wall is even flimsier than in vaginal fixation – and, while less dangerous in pregnancy, is even less efficient in prolapse. The exposure and delivery of

the uterus are the same as in vaginal fixation of the uterus – after which the details of the union are different. The salient feature of the union in the suspension operation is that pelvic parietal peritoneum and uterine peritoneum are brought into contact in the suturing (instead of uterine peritoneum and raw vaginal wall). This is accomplished in vagino-suspension of the uterus in one of two ways. Either the suspension sutures placed in the anterior uterine wall are carried through the incised peritoneum of the vesico-uterine fold, after which the margins of the peritoneum are sutured together, and the

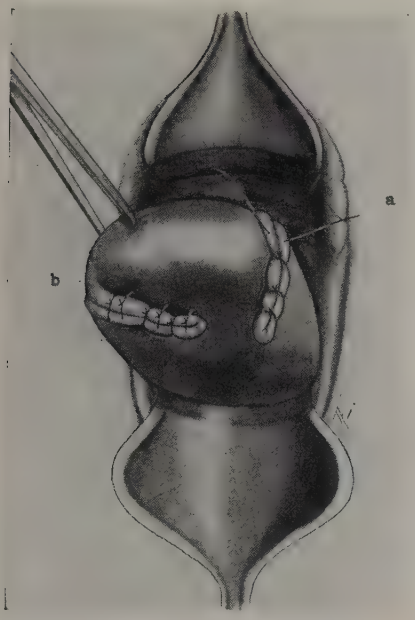


Fig. 5747.—Operation for Retrodisplacement of the Uterus, Compatible with Pregnancy, by Vaginal Shortening of the Round Ligaments: – **a**, The right ligament is being simply doubled upon itself and sutured together; – **b**, the left ligament is being both doubled upon itself and sutured together, and also anchored to the uterine wall.

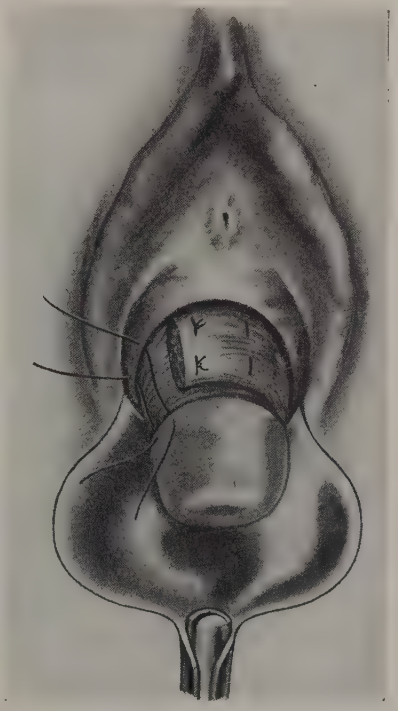


Fig. 5748.—Operation for Retrodisplacement of the Uterus, Compatible with Pregnancy, by Shortening the Uterosacral Ligaments Behind the Cervix Through an Anterior Colpoperitoneotomy Incision; – The uterus has been delivered into the vagina, with its anterior aspect pressed downward, tensing its posterior structures. The sutures have been placed in the posterior wall of the uterus and in the ligaments which, when tied, will shorten the ligaments.

suspension sutures then tied, and the vaginal wound closed (Fig. 5744). Or, the uterine suspension sutures are carried through both the margins of the incised peritoneum and the margins of the vaginal flaps (Fig. 5745.) In both instances, it will be seen, a layer of parietal peritoneum comes to lie between the uterus and the vaginal wall. Finally, in both methods of vaginal suspension, the margins of the peritoneal incision and of the vaginal flaps are brought together, separately, by sutures (Fig. 5746).

Operation for Retrodisplacement of the Uterus, Compatible With Pregnancy, by Vaginal Shortening of the Round Ligaments.—The ten-

dency of this procedure is to bring the uterine fundus forward without, however, accomplishing very much toward lifting the organ. The uterus is exposed and delivered into the vaginal opening through an anterior colpoperitoneotomy incision. When the round ligaments are seized the uterus may have to be partly returned to the peritoneal cavity before the tension of the broad ligaments will be sufficiently relieved to allow the round ligaments to be drawn far enough forward. The body of the uterus is then again drawn forward, and the round ligaments either simply doubled upon themselves and sutured together (Fig. 5747, **a**) or, better, the sutures which bind each ligament upon itself should also pass into the substance of the uterus, anchoring it in position (v. Fig. 5747, **b**).

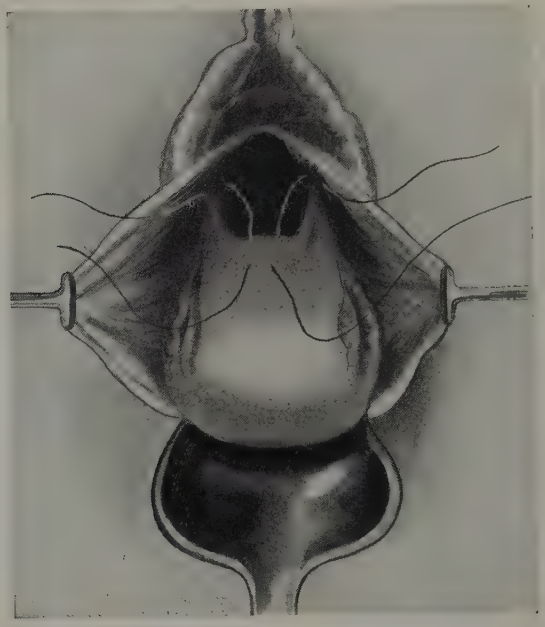


Fig. 5748, *a*.—Operation for Retrodisplacement of the Uterus, Compatible with Pregnancy, by Shortening the Uterosacral Ligaments in Front of the Cervix Through a Posterior Colpoperitoneotomy Incision. I; Sharp clamp forceps have pierced the lower parts of the broad ligaments, while the cervix is drawn well upward, and are in the act of drawing loops of the uterosacral ligaments forward, through the openings in the broad ligaments, after which the loops of the uterosacral ligaments will be sutured together in front of the cervix.

Operation for Retrodisplacement of the Uterus, Compatible With Pregnancy, by Shortening the Uterosacral Ligaments Behind the Cervix Through an Anterior Colpoperitoneotomy Incision.—The result of this technic is that the cervix is directed backward and upward, with a corresponding directing of the fundus uteri forward. The uterus is delivered through an anterior colpoperitoneotomy incision, and is then pressed well downward, exposing its posterior aspect (Fig. 5748). The uterosacral ligaments, lying within the peritoneal folds of Douglas, pass from the second and third sacral bones, forward and downward, upon the sides of the rectum, to be attached to the sides of the uterus opposite the junction of the supravaginal cervix and the corpus uteri (corresponding with the internal os). These ligaments are put upon the stretch by pressing the uterus downward and forward as it lies in the vagina. Seizing and tensing the sacral end of each ligament in turn,

a stout chromic catgut suture is passed through both its peritoneal covering and its ligamentous substance _ and through the posterior aspect of the cervix. When the two sutures are placed, so as to make an even pull upon the parts, they are tied _ thereby anchoring the shortening ligament against the cervix. The uterus is returned to the pelvic cavity and the peritoneal and vaginal incisions closed.

Operation for Retrodisplacement of the Uterus, Compatible With Pregnancy, by Shortening the Uterosacral Ligaments in Front of the Cervix Through a Posterior Colpoperitoneotomy Incision.—The exposure is here made through a median incision over the upper part of the posterior surface of the cervix and the posterior vaginal fornix, and its margins retracted (Fig. 5748, *a*). While the cervix is seized with vulsellum forceps and drawn well forward and upward, a sharp clamp forceps is pressed through the lower aspect of each broad ligament _ and made to seize the uterosacral ligament on each side and draw it forward through the opening in the broad ligament thus made alongside of the cervix _ after which the two loops of the opposite ligaments are sutured together with chromic catgut in front of the cervix (Fig. 5748, *b*). The ureters are especially guarded. The peritoneal and vaginal wounds are then sutured.

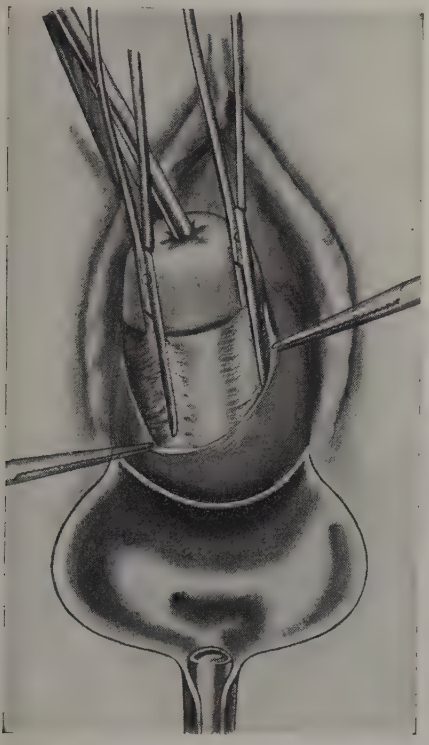
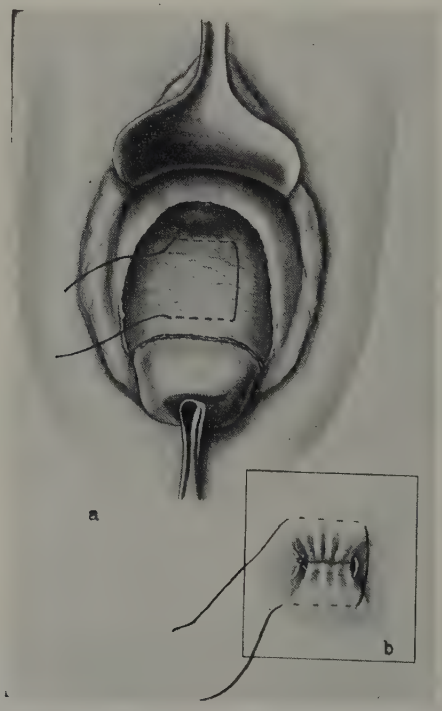


Fig. 5748, *b*.—The Same _ II; _ The uterosacral ligaments have been united in front of the cervix _ after which the vaginal wound will be closed.

Fig. 5748, *c*.—Sectional view of the uterus, drawn almost straight and delivered into the vagina by traction. The line along which section will be made, to expose the anterior aspect of the uterus, is dotted.

Figs. 5748, *d* and 5748, *e*.—Operation for Uterine Retroflexion by Uteroplastic Technic Through Anterior Vaginoperitoneotomy Incision.—I and II;—Sectional view of the retroflexed uterus—showing its curved and elongated anterior wall—and the upper and the lower limits of the sutures. II, Sectional view of the completed operation, showing the straightened and shortened anterior wall following the tying of the sutures.



Figs. 5748, *f* and 5748, *g*.—The Same—III and IV:—a, The passage of the first suture;—b, the first suture has been tied—and the reinforcing suture is being placed.

Operation for Uterine Retroflexion by Uteroplastic Technic.—In some less severe and uncomplicated grades of retroflexion it may be possible after exposing the uterus through the anterior vaginal fornix (Fig. 5748, *d*)

to straighten the uterus by sutures placed and tied as seen in Figs. 5748, *d* and *e*.

Instead of placing these sutures axially they may be applied in the manner shown in Figs. 5748, *f* and 5748, *g*.

OPERATIONS FOR PROLAPSUS UTERI BY THE VAGINAL ROUTE

Cystocele, rectocele, and prolapse of the uterus are considered relatively at p. 392 _ and prolapse of the inverted uterus at p. 431.

Operations for uterine retrodisplacements are covered in pp. 405-412.

Operations for prolapsus uteri may be divided, primarily, into two groups _ those performed with the expectation of, and not incompatible with, pregnancy _ and those performed when either the period of possible pregnancy is past, or where its occurrence is surgically rendered impossible during operation, either by the nature of the operation or by surgical sterilization, because of the danger to the patient should it occur.

Operations may be grouped, secondarily, into those carried out through the vaginal route _ and those conducted by the abdominal route (the latter being found further on).

There will be considered in this section, therefore _ operations performed by the vaginal route for prolapse of the uterus, compatible with safe pregnancy _ and operations performed by the vaginal route for prolapse of the uterus, incompatible with safe pregnancy.

Many operations for uterine prolapse by both the vaginal and the abdominal routes, compatible and incompatible with pregnancy, have been devised _ some of the chief ones of which will be here described.

In a large number of the cases of uterine prolapse acccompanying prolapse of the bladder (cystocele) or of the rectum (rectocele) is present _ in which the correction of these accompanying prolapses is either provided for in the special comprehensive technic undertaken _ or in connection with which some additional special technic may have to be undertaken for the prolapsed bladder or rectum.

Operation for Moderate Grade of Prolapsus Uteri by the Vaginal Route, Compatible with Pregnancy _ by Anterior Colporrhaphy _ Hegar. —The uterocervical canal is usually first curetted. The cervix is grasped with vulsellum forceps and drawn forward _ while the mucosa of the anterior vaginal wall is seized with another pair of clamp forceps just behind the urinary meatus _ thereby rounding out the anterior fornix and putting the anterior vaginal mucosa upon the stretch. An elliptic incision is then made by knife _ its length and width being determined by the degree of narrowing of the vaginal canal which may be desired. The oval area of mucosa thus represented is then raised by knife or by scissors (Fig. 5749), carefully guarding against possible injury to the bladder. The denuded area thus resulting is first partially brought together by a tier of buried chromic catgut sutures tied in the median line (Fig. 5750). It is especially in the placing of the uppermost ones of these sutures that one must be especially cautious as to not penetrating the wall of a bladder, which may be simultaneously prolapsed. Finally, interrupted marginal stitches are placed, which may also take hold of the underlying tissues, thus securing a buttress-like effect. The uterus is replaced in its normal position.

Operation for Prolapsus Uteri, by the Vaginal Route, Compatible With Pregnancy _ by Low Amputation of the Cervix, Partial Excision of the Anterior Vaginal Wall, with Anterior Colporrhaphy With or Without Accompanying Colpoperineorrhaphy.—This operation is especially useful

in cases where the cervix is hypertrophied or diseased and the uterus elongated. As high amputation of the cervix is usually incompatible with pregnancy, only the lower portion of the cervix should be amputated – certainly not nearer than within 1.2 cm. ($\frac{1}{2}$ inch) of the internal os. The operation usually begins with curettage. The bladder is generally freed from the cervix by blunt dissection, and displaced upward in the course of the operation. If there be accompanying laceration or relaxation of the vaginoperineal septum, or both, colpoperineorrhaphy is always performed as a part of the combined technics. Sometimes the vaginal operation is combined with one of the intra-abdominal procedures for prolapse or retroversion.

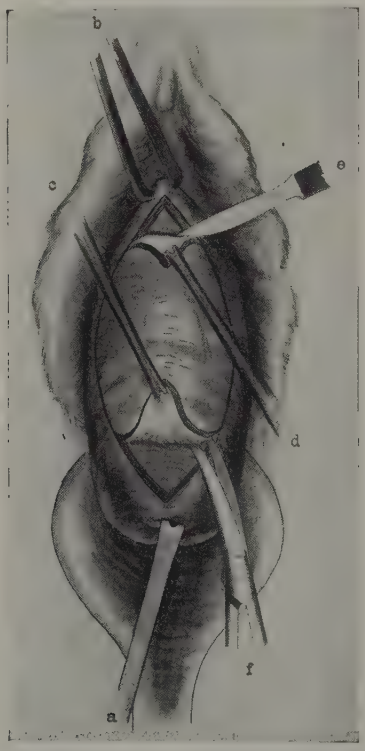


Fig. 5749.—Operation for Moderate Grade of Prolapsus Uteri by the Vaginal Route, Compatible with Pregnancy – by Anterior Colporrhaphy – Hegar – I; – Elliptic denudation of the anterior vaginocervical wall.

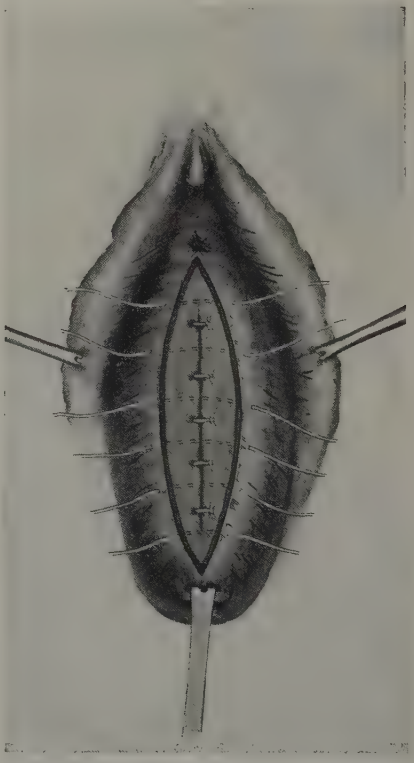


Fig. 5750.—The Same – II; – Closing the denuded ellipse – by a buried tier of median tied sutures – and a marginal tier.

The cervix is drawn down with vulsellum forceps and a shield-shaped denudation is outlined upon the anterior vaginocervical wall – the dimensions of which will be determined by the amount of tissue which it is considered best to remove – and includes the excision of the mucosa of the anterior vaginal fornix. At the lower part of the shield-shaped outline a circular sweep of the knife is made around the lower aspect of the cervix (Fig. 5751). The denudation is accomplished with curved, blunt scissors, while the mucosal flap is steadied with forceps. The possibility of wounding the bladder is to be borne in mind throughout – and when, or if encountered, is separated from the cervix by blunt dissection, and pushed upward. The circularly divided

mucosa is freed upward to a limited extent, so as to furnish a sufficient redundancy of mucosa for covering the cervical stump _ and the cervix is then circularly amputated just below the line of the retracted and circularly divided mucosa. All bleeding vessels are tied with fine catgut. By mobilizing the mucosa of the cervical canal to a slight extent its periphery can usually be drawn outward sufficiently to enable the already circularly freed cervical mucosa to meet it preparatorily to suturing. Sutures are so placed through the anterolateral vaginal fornices (v. Fig. 5751, **c, c**) and then into the substance of the uterus, at a lower level, that when the uterus is elevated into position these stitches will tend to hold the uterus upon a higher level dur-

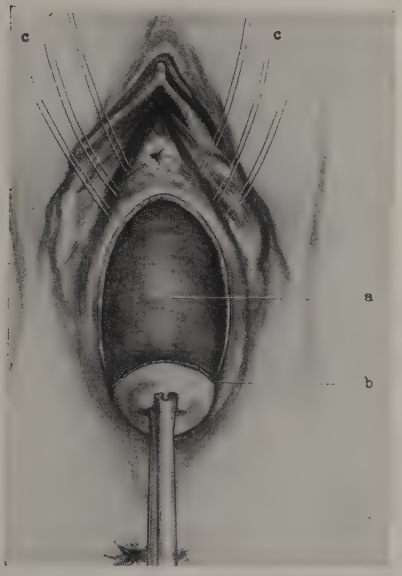


Fig. 5751.—Operation for Prolapsus Uteri, by the Vaginal Route, Compatible with Pregnancy _ by Low Amputation of the Cervix; Partial Amputation of the Anterior Vaginal Wall with Anterior Colporrhaphy; and With, or Without Accompanying Colpoperineorrhaphy _ I: _ **a,** Shield-like area of denudation upon the anterior vaginocervical wall, with circular incision, **b,** around the lower cervix; _ **c, c,** suspension sutures, inserted higher in the anterolateral vaginal fornices and lower in the uterine tissues.

Fig. 5752.—The Same _ II; _ The lower cervix has been amputated _ and the margins of the oval denudation have been united, **a** _ as well as the margins of the mucosa of the outer cervix and cervical canal, **b.** The suspension sutures, **c, c,** are ready to be tied

ing healing. The lateral margins of the shield-shaped area are then brought together by sutures in the median line _ mobilizing their margins if that be needed to accomplish approximation (Fig. 5752, **a**). At the amputated end of the cervix the opposite margins of the mucosa from the outer cervix and from the cervical canal are united by a few interrupted sutures (v. Fig. 5752, **b**). The suspension sutures, as it were, are not tied until the uterus has been elevated into its more normal position. They include the fibromuscular tissues at the base of the broad ligaments above, and the uterine tissues below.

Operation for Prolapsus Uteri, Compatible with Pregnancy, by Shortening the Undivided Broad Ligaments Through the Vaginal Route, Followed by Anterior Colporrhaphy _ Alexandroff.—The undivided broad

ligaments are here folded over the anterior aspect of the cervix uteri, and their folds united by sutures, constituting a shortened sling of support. The incision of approach is in the form of an inverted T, carried through the anterior vaginocervical mucosa – the lower, horizontal portion of the incision being carried far enough, on either side, to give access to the base of the broad ligaments. Through this incision two lateral, angulated vaginocervical flaps are temporarily turned outward by combined blunt and sharp dissection – until the base of the broad ligaments, which are relaxed in these cases, can be exposed, and the Surgeon's index-finger be carried beneath and behind the lower aspect of these relaxed structures, on either side, for the purpose of the subsequent manipulations. Conjointly with this somewhat extensive lateral exposure the bladder must be freed from its cervical attachment, and pushed upward in front, from the cervix and from its lateral impingement upon the broad ligaments and its contact with the anterior vaginal wall. This is an especially important part of the technic, for this separation and elevation of the bladder carries with it also the elevation of the ureters and the uterine arteries which cross immediately above them – thus tending to carry them out of harm's way during the suturing. Additional safety would be secured by having first passed ureteral sounds through the lower parts of the ureters by way of the urethra and bladder. Strangulation of either ureters or uterine arteries by the approximating sutures would be serious indeed.

The Surgeon introduces his finger below the lower, relaxed portion of the broad ligament of each side, in turn, and hooks the ligament forward by means of his bent finger, while he places fairly heavy, chromic catgut sutures, of the mattress type, in such a manner that, when tied, they will fold together the redundancy of the lower parts of the relaxed broad ligaments upon each other in front of the cervix (Fig. 5753), being most careful to place all sutures below the position of the two ureters and the uterine arteries – recognizing the former, if catheterized, by the presence of the resistant catheters, and the latter by their pulsation – otherwise the placing of the sutures must be a matter of individual judgment based on anatomic knowledge. The sutures pass through the broad ligament of one side – through the cervical tissue, at a somewhat lower level (so that, when tied, they will elevate the uterus) – and correspondingly through the opposite broad ligament. If there be only a moderate degree of relaxation of the broad ligaments, a single tier of mattress-sutures will suffice, approximating the folded aspects of the ligaments over the front of the cervix. If the degree of relaxation be greater, a second tier, overlying the first, may be indicated. Some form of reinforcement of the first tier of suturing is probably always desirable – even though it may not represent a second fold-overlap with mattress-sutures. The broad ligament sling is thus both shortened and brought in front of the cervix. The excess of the two triangular vaginal flaps is now excised – leaving an area of modified triangular denudation. When the margins of this area are united by suture, in the form of an anterior colporrhaphy, the diminished anterior vaginal wall will further aid in sustaining the replaced structures.

Conditions may also indicate the desirability of combining a colpoperineorrhaphy with the technic just described.

Operation for Prolapsus Uteri, Compatible with Pregnancy, by Shortening the Divided Broad Ligaments Through the Vaginal Route, Followed by Anterior Colporrhaphy – Hertzler-Dudley.—This operation does not vary, in principle, from the preceding – from which it chiefly differs in that the lower aspects of the broad ligaments are first divided, and their divided margins are sutured together in front of the cervix (Dudley) – or the divided ends are overlapped and sutured in front of the cervix (Hertzler).

The only practical difference between this and the preceding operation as to the technical details, therefore, is that when the lower aspects of the broad ligaments have been exposed, through the same preliminary manipulations, a ligature is usually carried through the lower part of the broad ligament, close to the cervix, on each side (though if bleeding be unlikely, this is sometimes omitted) _ after which the lower aspect of each broad ligament is clamped to the outer side of the ligatures, and, while a finger hooks the ligament forward, its lower part is divided by scissors (Fig. 5754). The cut margins of these

Fig. 5753.—Operation for Prolapsus Uteri, Compatible with Pregnancy, by Shortening the Undivided Broad Ligaments Through the Vaginal Route, Followed by Anterior Colporrhaphy _ Alexandroff; _ Exposure, by an inverted T-shaped incision, through the anterior vaginal wall, of the anterolateral cervico-uterine region and the lower aspects of the broad ligaments. Any redundant portions of the triangular vaginal flaps may be subsequently excised before suturing them. Mattress-sutures are being placed through the lower aspects of the bases of the opposite broad ligaments, below the ureters and uterine arteries, while a finger, introduced under and behind the lower aspect of each broad ligament, in turn, hooks it forward. Tying the sutures will approximate opposite folds of broad ligaments in front of the uterus.

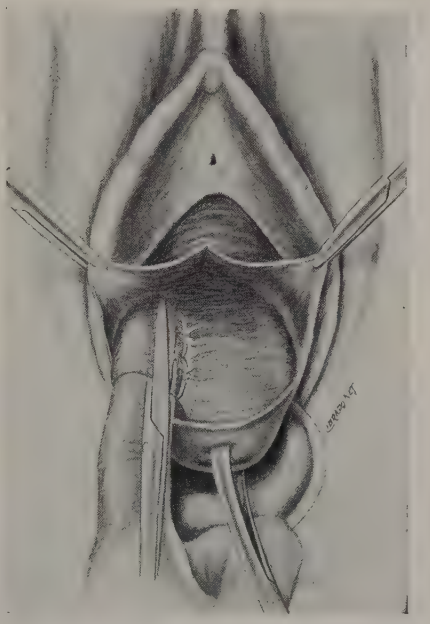


Fig. 5754.—Operation for Prolapsus Uteri, Compatible with Pregnancy, by Shortening the Divided Broad Ligaments, Through the Vaginal Route, Followed by Anterior Colporrhaphy _ Hertzler-Dudley _ I; _ The lower portion of each broad ligament is exposed, brought forward, ligated close to the uterus, clamped just to the outer side, and divided between ligature and clamp.

lower portions of each broad ligament are then either simply brought into contact, in front of the cervix, and sutured together, end to end (Dudley) _ or are overlapped in front of the cervix, and anchored by a stout chromic catgut suture at each end, approximating broad surface to broad surface (Fig. 5755). By this act the upper portion of the uterus is sustained by the normally placed parts of the broad ligaments which have not been disturbed _ while the cervix is directed backward, and somewhat elevated, by the parts of the broad ligaments which have been longitudinally divided and then overlapped

and anchored in front of the cervix. The vaginal wound is closed by anterior colporrhaphy.

Operation for Prolapsus Uteri, Compatible With Pregnancy, by Shortening the Uterosacral Ligaments Through the Vaginal Route.—This technic is the same as that carried out in the operation for retrodisplacement of the uterus by shortening the uterosacral ligaments through the vaginal route _ and is described on pp. 410 and 411.

Operation for Prolapsus Uteri, Compatible With Pregnancy, by Shortening the Round Ligaments Through the Vaginal Route.—This operative procedure is also the same as that for retrodisplacement of the uterus by shortening the round ligaments through the same route, p. 409.

Operation for Moderate Prolapsus Uteri, Incompatible With Pregnancy, by Vaginofixation of the Uterus.—This technic is the same as when

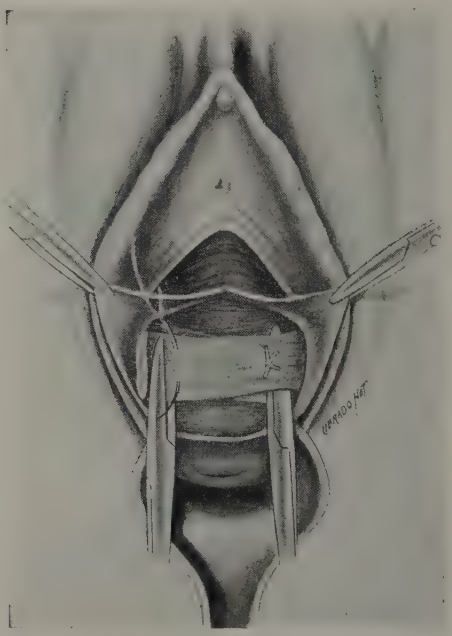


Fig 5755.—The Same _ II; _ The lower aspects of each broad ligament has been divided _ and these portions have then been crossed in front of the cervix _ and anchored at both ends by suture.

performed for retrodisplacement of the uterus, under which heading it is described (v. p. 406).

Operation for Prolapsus Uteri, Incompatible With Pregnancy, by Interposition of the Uterus Between the Bladder and the Vagina _ Accomplished Through Anterior Colpoperitoneotomy _ Schauta-Wertheim. —The scope of this, one of the more radical operations for prolapsus uteri, is covered, briefly, in the title. To make room for the uterus the bladder is partially mobilized and pushed upward. The incision of approach is a median one, down through the anterior vaginal wall, from just below the urinary meatus onto the cervix. The first step, following this incision of access, is to separate the two lateral vaginal flaps thus provided from the anterior wall of the bladder _ which is best accomplished mainly by blunt dissection, steadying the margins of the flaps by T-forceps, while a gauze-covered finger pushes the resistant vaginal flap from the underlying connective tissue, the opposite

index-finger offering counterpressure the meantime from the mucosal aspect of the flap _ aiding, where necessary, by scissor snips. The next step is to separate the bladder from the cervico-uterine wall by the same general method of mobilization _ beginning by a few scissor snips at the vesicocervical junction and displacing it upward _ the separation being only carried on to a sufficient extent to make room for the delivery and anchorage of the body of the uterus between the bladder and the vagina. (See Fig. 5756.)

The vesico-uterine fold of peritoneal reflection is next recognized _ usually by the sensation of two peritoneal surfaces gliding over each other, as the finger

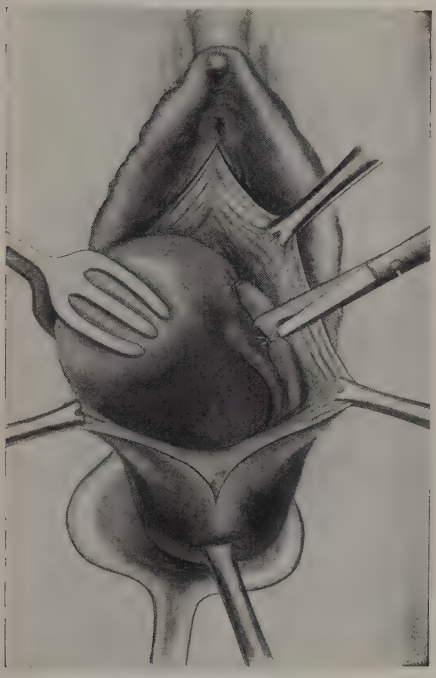


Fig. 5756. — Operation for Prolapsus Uteri, Incompatible with Pregnancy, by Interposition of the Uterus Between the Bladder and Vagina _ Accomplished Through Anterior Colpoperitoneotomy _ Schauta-Wertheim _ I; _ The fundus of the uterus has been delivered through the anterior colpoperitoneotomy wound. The fallopian tubes have been doubly ligated in potentially child-bearing uteri and the portion between the ligatures excised.

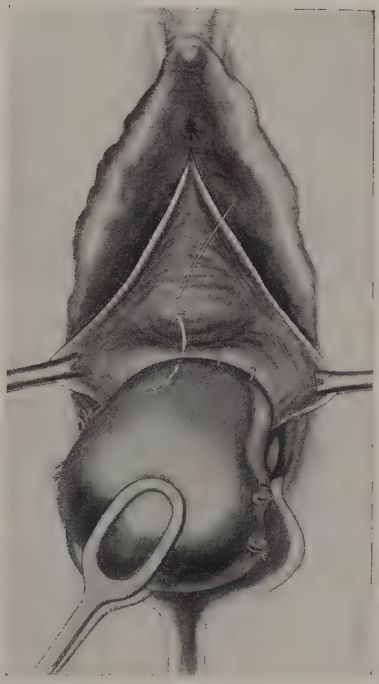


Fig. 5757.—The Same _ II; _ The indicated portions of the doubly ligated fallopian tubes have been excised. The anterior margin of the incised vesico-uterine peritoneal reflection is being sutured to the now posterior aspect of the body of the uterus.

presses the structures, underlying the retracted bladder, against the anterior uterine wall. Putting this loose pouch of peritoneal tissue upon the stretch, between two clamps, it is incised laterally (v. Fig. 5757). Thread tractors are placed in each lip of the incised peritoneum for future use. If the anterior cervico-uterine wall have been followed too closely in mobilizing the bladder and in searching for the vesicoperitoneal reflection, then one may continue to dissect on too far upward in the connective-tissue plane between the peritoneum itself, on the one hand, and the wall of the cervix and uterus on the other. The peritoneal reflection is then only to be recognized by working for-

ward toward the bladder. Through the opening made in the peritoneum the Surgeon introduces the right first and second fingers into the peritoneal cavity, and examines the conditions as to uterine adhesions and other complications. If correctable abnormal conditions are encountered, these are first attended to. If conditions are otherwise found favorable to the technic undertaken, the fundus of the uterus is grasped with non-traumatizing, uterus-holding forceps and drawn through the transverse anterior vaginoperitoneotomy wound (Fig. 5756). During the delivery of the uterus the bladder is held well upward by a retractor. If delivery of the uterus be not attempted until the fundus is

Fig. 5758.—The Same—III;—The partially delivered uterus is here shown thrown upward, so that its anterior aspect again looks forward. The margins of the vaginal flaps from which the excess has been excised are being sutured into contact over the anterior face of the uterus.

Fig. 5759.—The Same—IV;—As an alternative technic, usually employed, so much of the margins of the redundant vaginal flaps has been excised that these shortened margins are now brought over the major portion of the presenting face of the uterus, but must be so sutured as to leave an ellipse of the anterior uterine wall protruding between, so that a denser and stronger scar formation will tend to hold the uterus permanently in position.

reached, and no impediment otherwise exist, its delivery is easily accomplished by following up its anterior wall until a hold upon the fundus can be secured.

For the purpose of rendering pregnancy impossible (in those cases within child-bearing age) both fallopian tubes are doubly ligated and the portion between excised (v. Fig. 5756).

While the uterus is depressed, thus bringing its normally posterior aspect to look forward, the margin of the vesico-uterine peritoneal fold is sutured to the posterior surface of the uterus by several deeply placed interrupted chromic catgut sutures (v. Fig. 5757). Both temporary tractor sutures are now removed from the margins of the incised peritoneum. The uterus is now

thrown forward, so that its anterior surface again looks forward (Fig. 5758), and, while thus held, the margins of the vaginal flaps are sutured over this surface by sutures of the same sort as those just mentioned. Any excess of the vaginal flaps which is apt to be present after the cystocele has been reduced is excised. Some Surgeons provide for the meeting of the margins of the vaginal flaps over the surface of the uterus – and others especially excise so much of the vaginal flaps that their margins must be sutured to the anterior uterine wall, leaving an oval ellipse of the uterus wall projecting between the margins of the vaginal flaps, for the purpose of securing a scar of firmer anchorage (Fig. 5759). The position of the uterus and of the upwardly lifted bladder at the completion of the operation are seen in Fig. 5760.

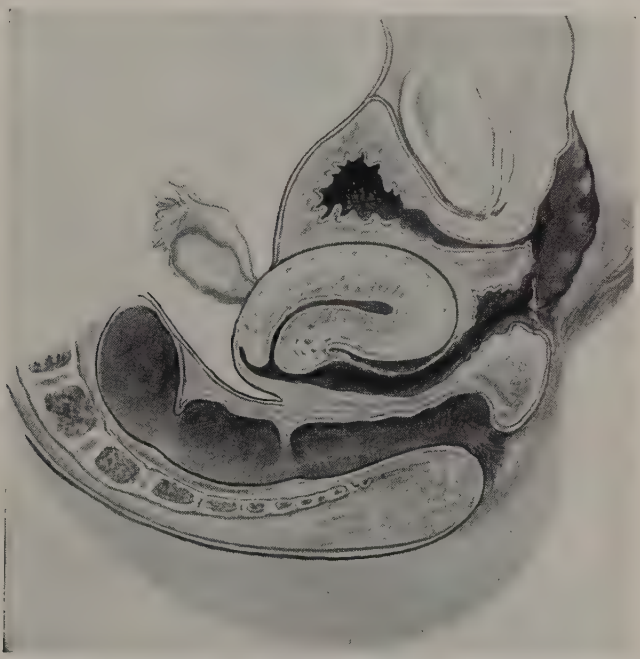


Fig. 5760.—The Same – V; – The appearance of the parts upon the completion of the operation – the fundus and body of the uterus lying forward, between the anterior vaginal wall and base of the bladder, which latter structure it supports – while the cervix is directed more backward than normally – the general axis of the uterus being about horizontal.

In order to make less likely either the further prolapse of the fundus end of the uterus – or its slipping out from under the bladder into its old position – Crossen carries two buried chromic catgut sutures through the fundus of the uterus, one on either side, and then through the firmer, more resistant tissues (as determined by grasping them with forceps) which are attached to the pubic arch on each side (Fig. 5761).

The uterus must not be fastened so far forward that it may compress the urethra.

The operation is usually begun by dilating and cureting the cervico-uterine canal – and ended by vaginoperineorrhaphy.

Sometimes it will be impossible to get the uterus to assume the correct horizontal position, especially where the cervix is long – unless the cervix be first amputated before the anchorage of the fundus.

The fundus of the uterus may be so large as not to be readily disposed of between bladder and vagina – in which case a wedge-shaped piece of the uterus may be excised, and the cut uterine walls brought together before the anchorage.

It will be seen by examining the sectional view of the completed operation (v. Fig. 5760) that the body of the uterus has been made to fill in the site of least resistance in the pelvic floor, and, at the same time, sustain the bladder.

The Schauta-Wertheim operation, above described, represents the later elaboration of the earlier methods of Freund, and the modifications of Freund's technic, practised for complete uterine prolapse. In Freund's original procedure (Fig. 5762) a posterior colpoperitoneotomy was performed, and through

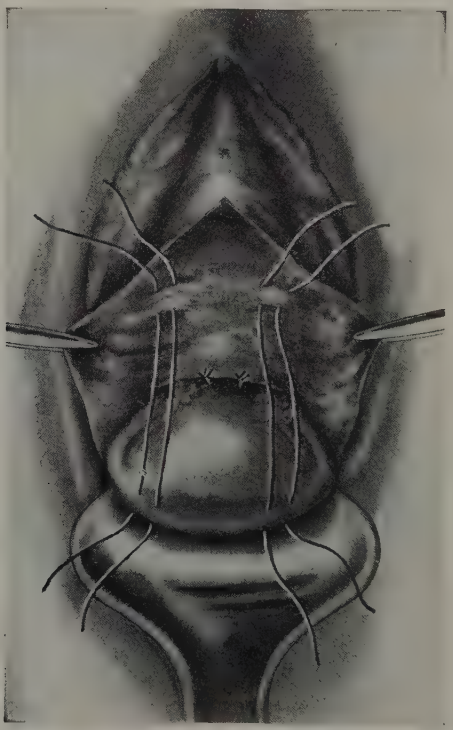


Fig. 5761.—Method of Reinforcing the Uterine Anchorage, in the Interposition Operation – Crossen's Technic; – Buried sutures passing between the fundus uteri, below, and the more resistant structures attached to the pubic arch, above.

this opening into the pelvic peritoneal cavity the fundus and body of the uterus were drawn (after which this opening was closed by suture) – so that the anterior wall of the uterus came to lie downward and the posterior uterine wall upward. Denudations of the two outer walls and of the anterior and posterior vaginal walls were then made – and the anterior uterine wall was sutured with catgut to the posterior, or lower vaginal wall – and the posterior uterine wall to the anterior, or higher vaginal wall. After this an artificial canal was made through the now presenting fundus of the uterus, into the cavity of the organ, for drainage. Fritsch modified Freund's operation by entering the pelvic peritoneal cavity through an anterior colpoperitoneotomy wound (Fig. 5763) and through this he delivered the uterus into the vagina (rather than into

the connective-tissue plane between the bladder and the anterior vaginal wall, as is done in the Schauta-Wertheim technic) – in such a manner that the an-

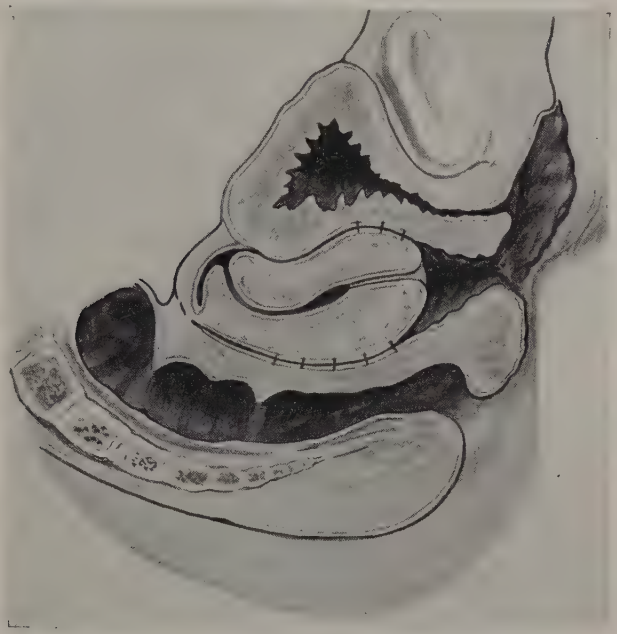


Fig. 5762.—Freund's Original Operation for Complete Uterine Prolapse – See text.

Fig. 5763.—Fritsch's Modification of Freund's Original Operation for Complete Uterine Prolapse – See text.

terior uterine wall looked downward, and the posterior wall upward. The denuded anterior vaginal wall and posterior uterine wall were then sutured together. As the uterine canal pointed downward and into the roomier

posterior vaginal fornix, no artificial drainage of the uterine canal was required.

Operation for Prolapsus Uteri, Incompatible With Pregnancy, by Partial Colpocleisis – Le Fort-Hartmann Technic.—This procedure may be carried out in some exceptional cases, especially in the aged. In the operation of partial colpocleisis provision is made for uterine drainage by the lateral vaginal tracts which remain unobliterated. In the Le Fort original method comparatively small areas were denuded, the resulting union being apt to prove insufficient. In the Hartmann method much longer and broader tracts are denuded and united. The prolapse is made complete by traction (Fig. 5764) and two long, broad strips of mucosa are denuded from the anterior and posterior walls of the vagina and cervix – extending from the cervix above down nearly to the urinary meatus, upon the anterior vaginal wall, and nearly to the fourchette upon the posterior wall. Buried chromic catgut sutures are

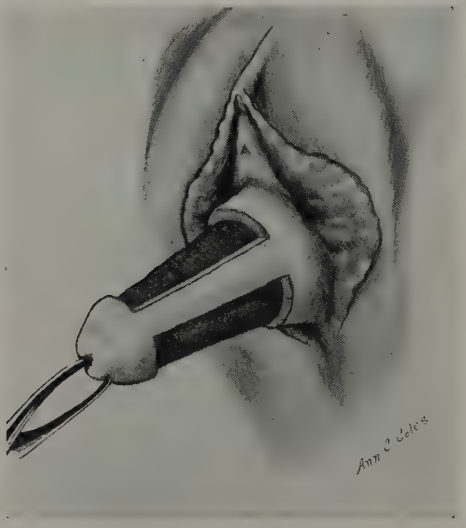


Fig. 5764.—Operation for Prolapsus Uteri, Incompatible with Pregnancy, by Partial Colpocleisis – LeFort-Hartmann – I; – The cervix is drawn well out of the vagina – and two quadrilateral surfaces of cervicovaginal mucosa and connective tissue are outlined and excised – after which the uterus is pushed back into the dome of the vagina.

now inserted and tied in pairs, beginning nearer the cervix – and rolling into the vagina the sutured parts, as each pair is placed (Fig. 5765). Lateral sutures are also placed as shown in Fig. 5766. The prolapsus is reduced *pari passu* with the insertion of the stitches – until, finally, the parts present the appearance, upon section, as seen in Fig. 5767.

In some cases, where the uterus is atrophied and where no fluid flows from it, the colpocleisis may be made complete – by entirely removing the vaginal mucosa of the rolled-out parts, and then placing successive circular sutures which draw the walls together – followed by a tight colpoperineorrhaphy.

Dudley's method of patrial colpocleisis for prolapse is seen in Fig. 5768.

Operation for Prolapsus Uteri, Incompatible With Pregnancy, by High Amputation of the Hypertrophied Cervix, Followed by Vaginal Fixation of the Uterus, Anterior Colporrhaphy of the Narrowed Vaginal Wall, and High Colpoperineorrhaphy – Bandler's Technic.—This method

of procedure is applicable to cases of extreme uterine prolapse, accompanied by marked hypertrophy of the cervix. The approach is made, after drawing

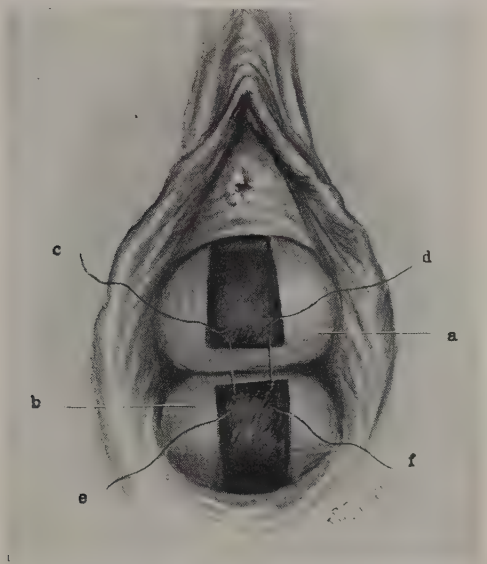


Fig. 5765.—The Same _ II; _ Placing the first buried sutures, ce and df, in the anterior and posterior tracts of denudation; _ a, anterior, b, posterior vaginal walls.

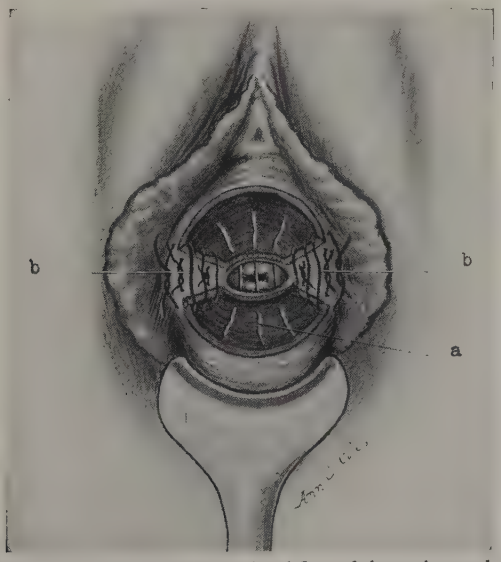


Fig. 5766.—The Same _ III; _ The denuded roof and floor of the vagina are brought together by two or more tiers, a, of buried sutures, each succeeding tier burying in the preceding. The first tier is seen placed. *Pari passu*, the lateral aspects of the denudations (not here clearly shown) are closed by interrupted sutures, b, b. Lateral denudation and suturing, shutting off the uterus entirely, can only be employed if the uterus throws out no discharge, as in atrophied organs.

the cervix downward, through the anterior vaginal wall, by either a median or an inverted T-shaped incision _ the first steps being those of the usual an-

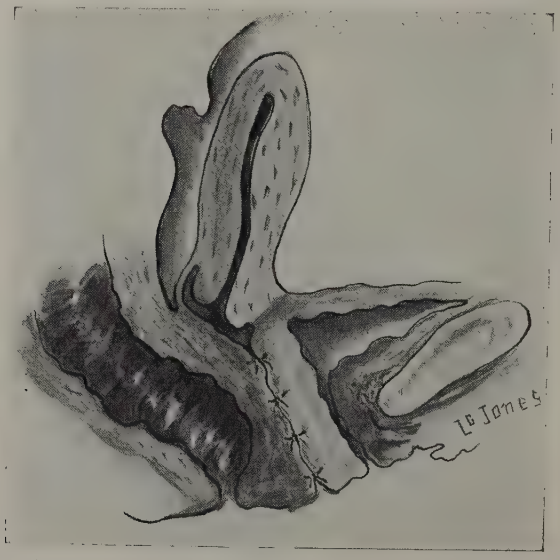


Fig. 5767.—The Same – IV; – The appearance of the parts, in section, after suturing.

Fig. 5768.—Operation for Prolapse of the Uterus, Incompatible with Pregnancy, by Partial Colpocleisis – Dudley: – a, Elliptic area excised from both lateral fornices, with long diameter, antero-posterior, which is then sutured in the axis of the ellipse (that is, transversely); – b, oval denudations of each lateral vaginal wall – the sutures of which extend from behind forward, and from above downward, thus lifting up the anterior vaginal wall.

terior colpoperitoneotomy (v. p. 372). As soon as the vaginal wall has been incised the margins of the vaginal flaps are freed outward – and then the bladder is carefully mobilized, chiefly by blunt dissection, from the anterior

and lateral walls of the cervix and uterus, and retracted upward. The vesico-uterine fold of peritoneum is then incised transversely. After introducing two fingers into the pelvic peritoneal cavity to examine the conditions which may present, the fundus of the uterus is seized by uterine forceps and delivered through the opening, into the vagina, while an upper retractor, within the peritoneal cavity, elevates the anterior vaginal wall _ and a lower one depresses the posterior wall (Fig. 5769). During this maneuver of delivery the cervix is pushed backward into the vagina. If the uterus be one potential of child-bearing the tubes are doubly ligated on each side, and the portions between each set of ligatures excised (v. Fig. 5756). In those cases in which the body of the uterus is to be attached to the diminished anterior vaginal wall _ which, though not invariably done, is contemplated in the present description _ then

Fig. 5769.—Operation for Prolapsus Uteri, Incompatible with Pregnancy, by High Amputation of the Hypertrophied Cervix, Followed by Vaginal Fixation of the Uterus, Anterior Colporrhaphy of the Narrowed Vaginal Wall, and High Colpoperineorrhaphy _ Bandler's Technic _ I; _ The uterus has been delivered through an anterior colpoperitoneotomy wound, the tubes have been doubly ligated, the intervening portion being ready for excision _ and four fixation sutures placed in the anterior uterine wall.

four fixation sutures are preliminarily placed in the anteror wall of the uterus, their ends being grasped by clamps and temporarly placed over the pubis _ Bandler using two heavy braided silk and two No. 3 chromic catgut stitches for this purpose (v. Fig. 5769). The final steps of the fixation may be carried out at once _ but are best accomplished at a later stage of the operation.

The fundus is now returned to the peritoneal cavity, and the cervix again drawn outward, and thrown upward, toward the symphysis. The cervix is surrounded by a circular incision, passing to the muscle tissue, and at such an elevation as to pass around the cervix just below the level of Douglas' culdesac _ after which the vaginal mucosal and submucosal tissues are freed toward the body of the uterus by combined blunt and sharp dissection (Fig. 5770). This freeing is carried up past the level of the posterior peritoneal reflection. Sometimes only the posterior part of the encircling incision is first carried out,

and this part freed upward, after which the lateral and anterior aspects of the mucosa are incised by scissors and peeled upward as high as the uterine arteries. The general bleeding and the safety of the uterine vessels are probably best conserved by the latter method. The bladder is retracted well upward, and the lateral walls of the vagina well outward during these steps. The cervix is then amputated transversely (Fig. 5771), making the section from the anterior aspect in repeated transverse sweeps of the knife – grasping with vulsellum forceps the anterior half of the divided uterus proximal to the section as soon as the division exposes the cervical canal, to hold the uterus under control. By proceeding in this manner damage to the uterine arteries is usually

Fig. 5770.—The Same – II; – The fundus of the uterus has been temporarily returned to the peritoneal cavity – the cervix has been drawn forward – and a high amputation of the enlarged cervical tissue is being performed.

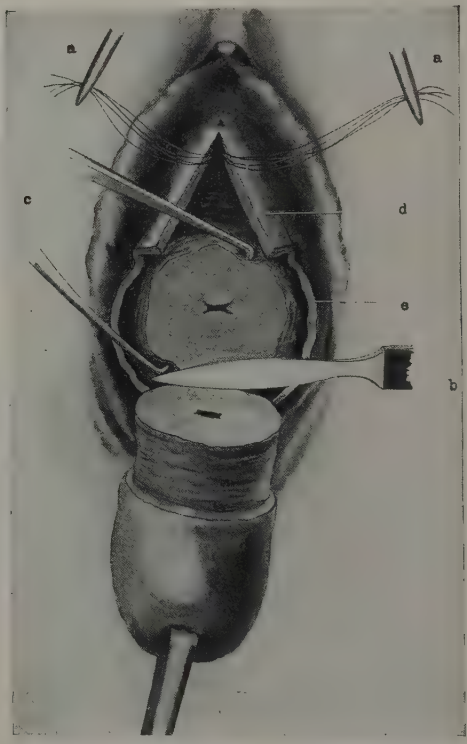


Fig. 5771.—The Same – III; – The hypertrophied cervix is being amputated at a high level by transverse division of knife – while the body of the uterus is being steadied by volsellum forceps, so that it will not recede into the pelvic cavity: a, a, Clamped fixation sutures; – e, d, trimmed vaginal walls.

avoided. All bleeding vessels are ligated. The amount of hypertrophied cervix removed is sometimes larger than the amount of uterus left.

The covering of the uterine stump and the closing in of the vaginal wound will be somewhat modified according to the individual case. There will be a redundancy of vaginal flaps – the excess being trimmed away from each lateral margin until it is calculated that just enough vaginal covering is left, contributed equally by the two sides, so that when united over the stump of the uterus and above it, in the median vaginal line, the resulting anterior vaginal wall is left taut enough to keep the body of the uterus from sagging down into the vagina, while also not taut enough to force the fundus of the uterus too far

backward from the symphysis pubis. The bladder will be eventually supported by the fundus of the uterus. The trimming, therefore, of the vaginal wall redundancy must be guided largely by the required "fit" of the covering. The posterior aspect of the vaginal covering is first sutured into the floor of the remaining portion of the cervical canal – being caught up about 2 cm. ($\frac{3}{4}$ inch) from its edge by No. 3 chromic catgut sutures – so as to calculate to cover the transversely divided end of the uterus, with some excess to be tucked into the cervical canal (Fig. 5772), the stitches passing through the cervical mucosa and cervical tissues as well as the vaginal mucosa. This method of suturing is also applied to the lateral aspects of the vaginal and cervical tissues until the partly sutured wound presents the appearance shown in Fig. 5773 – thereby constructing a new artificial os, and leaving only the lateral margins of the vaginal flaps unsutured in the median line.

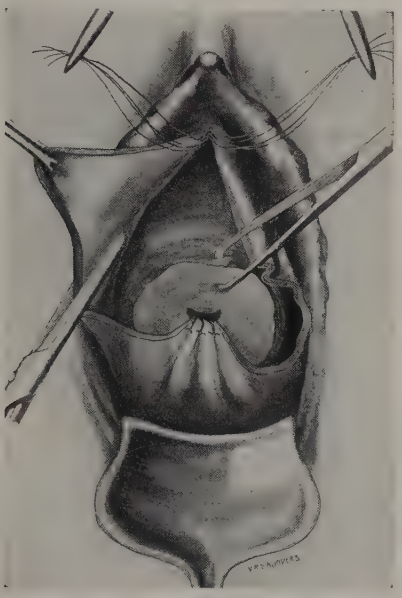


Fig. 5772.—The Same – IV; – Covering the stump of the uterus and restoring the cervico-uterine canal, preparatorily to closing the rest of the vaginal wound and tying the fixation sutures.

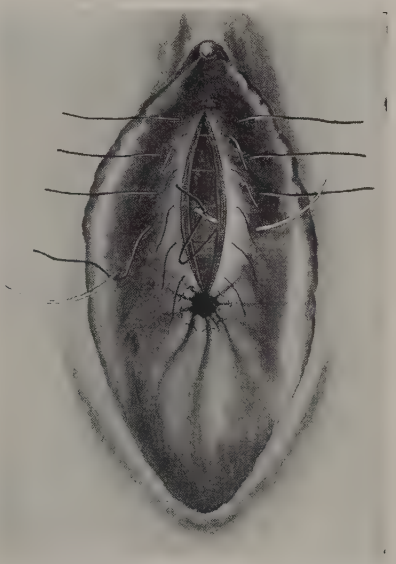


Fig. 5773.—The Same – V; – The uterine stump has been covered and the uterocervical canal re-formed. The fixation sutures have been carried through the margins of the vaginal flaps – and will be tied as soon as the margins of these flaps have been separately sutured together.

At this stage, and in those cases in which the body af the uterus is to be fixed to the anterior walls of the vagina, the four previously placed fixation sutures are now rethreaded (or a Reverdin needle is employed), and they are carried through the margins of the lateral vaginal flaps (v. Fig. 5773). The margins, themselves, of these flaps are then sutured together – after which the fixation sutures are tied, last of all.

As a final step of this technic a high colpoperineorrhaphy is performed – during which a complete separation is accomplished of whatever rectocele may be present, from the posterior wall of the vagina, to within 1.2 to 2 cm. ($\frac{1}{2}$–$\frac{3}{4}$ inch) of the newly made external os. The fixation sutures are sometimes not tied until this is carried out, as the freeing of the rectum from the posterior vaginal wall is made easier thereby.

Operation for Marked Prolapsus Uteri by Complete Vaginal Hysterectomy, Followed by Vaginopelvic Fixation – Mayo.—The uterus is here excised through the vagina, with temporary clamp control, after which the lateral stumps of the structures from which the uterus has been excised are sutured together, and fixed to the anterior vaginal wall, between the vagina and the bladder. A median incision is made down the anterior vaginal wall, to the cervix, where the incision diverges to encircle the cervix, meeting behind it. The attachments of the vagina to the uterus laterally and posteriorly are freed by blunt dissection for a distance – and the bladder is similarly freed from the anterior vaginal wall well forward. The peritoneum is then opened, beginning in the anterior fornix and extending laterally and backward. One or more temporary tractor sutures are placed in the margins of the cut peritoneum. A digital examination is next made of the intrapelvic conditions through the opened peritoneum – after which the fundus of the uterus is seized by uterine forceps and brought forward through the anterior vaginal opening, until it lies delivered within the vaginal outlet, with the fundus inclined upward and forward. The broad ligament is then clamped from forward and above, downward and backward, alternately on each side of the uterus, by three sets of clamps – the ligaments being divided between clamp and uterus as each segment is clamped – to make room for the clamping and dividing of each succeeding segment. In the first set of clamps the round ligaments and the fallopian tubes are seized. (Where both the tubes and ovaries are to be removed this set of clamps includes the round ligaments and the infundibulopelvic ligaments.) In the second set of clamps the middle thirds of the broad ligaments are grasped. In the third set of clamps, the lower aspects of the broad ligaments are pressed, the inner blades of the clamps being made to pierce the peritoneum of Douglas' culdesac, on each side, at the sites where it is connected with the posterior vaginal wall, thereby controlling the uterine arteries, sacro-uterine ligaments, and the ligamenta lata colli – carefully guarding against the inclusion of the ureters.

When the structures lying between these clamps and the uterus, on each side, have been divided with scissors the uterus is free, and is removed. The clamps are then taken by an Assistant and are so manipulated as to approximate the divided structures in the median line, ready for ligature and suture with chromic catgut – which are applied from below upward and distal to the clamps. The lowermost ligatures, which control the main blood-supply, are passed behind the clamps, to the outer side, and tied in front, thereby controlling the structures of these segments (uterine arteries, sacro-uterine ligaments, and ligamenta lata colli). To make these important ligatures doubly secure they may penetrate the middle of the segment to be ligated, and then be first tied above, and then below the segment, so that there will be no danger of their slipping. These clamps are removed – and the lower and upper ends of the ligature tied together – after which the upper ends are continued, mattress-suture fashion, through the middle and upper segments, drawing the opposite ends of the stumps into close apposition – until the uppermost structures clamped by the highest set of clamps are reached – when the suture, on each side, is carried around the fallopian tube (or the infundibulopelvic ligament) and the round ligament, making the double half-hitches to secure the ovarian vessels – after which each suture passes through the anterior vaginal wall, from behind forward (far enough behind the urinary meatus, and superficially enough not to endanger the urethra). When this suture is tied (after the margins of the vaginal wall are sutured) the sutured-together layer of round, broad, and sacro-uterine ligaments are approximated and fastened to the anterior vaginal wall in the position which the bladder formerly occupied.

Any lax portion of the vaginal wall, on either side, is now excised – and the margins of the vaginal flaps brought together by suturing, approximating these margins over the stumps of the structures cut from the sides of the uterus. The patient's bladder is catheterized every six hours unless she can voluntarily empty it. Urotropin is administered – and the recumbent posture is maintained for two weeks.

OPERATIONS FOR INVERSION OF THE UTERUS, IN GENERAL

Definition.—Inversio uteri is a condition in which, when marked, the inner mucous lining of the uterus becomes its outer coat – and its outer, serous covering, its inner coat. The inversion of a glove finger (representing the uterus) into the cavity of the hand portion of the glove (representing the vagina), and thence out through the buttoned wristlet of the glove (representing the vaginal outlet) will give a very fair idea of both the grades of inversion – and the manner of their production.

Varieties of Inversion of the Uterus:

(*a*) Pathologic, those which have their origin in some abnormal, anatomic, causative condition, such as a tumor.

(*b*) Postpartum inversion, or inversion of the organ following labor.

Degree of Inversion of the Uterus:

(*a*) First Degree – or Intra-uterine Inversion of the Uterus – inversion of the uterus into its own cavity, no part of the fundus passing the undilated external os – the varieties being:

Initial partial intra-uterine invagination (Fig. 5774).

Intermediate partial intra-uterine invagination.

Complete intra-uterine inversion.

Fig. 5774.—Initial Stage of Intra-uterine Inversion of the Uterus.

(*b*) Second Degree – or Intravaginal Inversion of the Uterus – the inverted body of the uterus projecting into the vagina for various extents between the external os uteri and vaginal outlet:

Partial intravaginal inversion – the inverted fundus projecting through only a portion of the vagina (Fig. 5775).

Complete intravaginal inversion – the inverted fundus projecting through the length of the vagina to, but not through, the vaginal outlet (Fig. 5776).

Fig. 5775.—Partial Intravaginal Inversion of the Uterus.

Fig. 5776.—Complete Intravaginal Inversion of the Uterus.

Fig. 5777.—Partial Extravaginal Inversion of the Uterus

(*c*) Third Degree – or Extravaginal Inversion of the Uterus – in which the uterus is either partly or entirely outside of the vagina, also partly inverting the vaginal wall as well – constituting prolapsus uteri inversi. The partial variety of this degree is seen in Fig. 5777.

OPERATION FOR INVERSION OF THE UTERUS BY ANTERIOR COLPO-HYSTEROTOMY

SPINELLI'S OPERATION

Description.—In this procedure the anterior vaginal fornix is incised, the bladder pushed upward, and the peritoneum opened at the site normally corresponding with the vesico-uterine peritoneal reflection. The inverted uterus is then split down the anterior median aspect – after which it is reinverted,

sutured, and returned to the pelvic cavity — and the vaginal opening is closed with temporary drainage. The anterior operation is probably the more frequently performed.

Operation.—The inverted uterus and the vagina are thoroughly cleansed — and, in some of the chronic cases, the everted exhuberant and granulating mucous surface of the uterus is curetted. The operation is sometimes aided by making the inversion complete, by traction, when only partial inversion is present. It brings the infundibulum of the inverted uterus more conveniently within reach when the peritoneum is opened. While this latter fact is true,

Fig. 5778.—Operation for Inversion of the Uterus by Anterior Colpohysterotomy — Spinelli's Technic — I; — Incising the anterior vaginal fornix transversely — and the anterior vaginal wall axially.

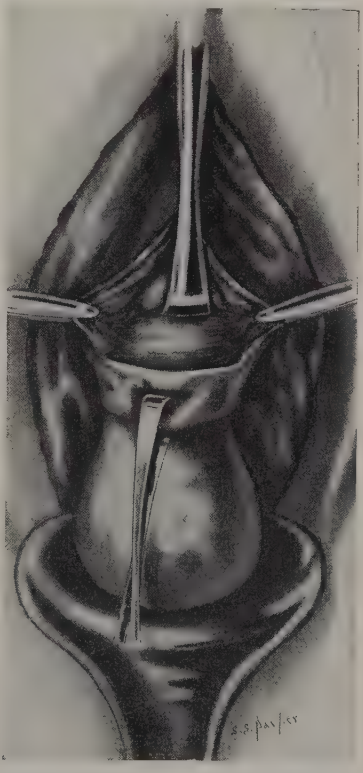


Fig. 5779.—The Same — II; — Retracting the vaginal flaps and mobilizing the lower portion of the bladder by blunt dissection.

in so far as gaining access to the now peritoneally lined uterine cavity after the peritoneum is incised, it is also to be remembered — and this part of the technic is stressed by some — that one must not proceed as though the most extensive sections are to be made — but to increase more limited ones as further length is required. It is sometimes found possible to reinvert the uterus and restore it to the peritoneal cavity without incising the peritoneum at all.

The inverted uterus is delivered entirely without the vagina, drawn downward, and pushed backward — so as to expose the region of the anterior fornix as well as the crowded state of the vagina will permit. A transversely curved incision is made across the anterior vaginal fornix just above the cervix — and

a vertical vaginal incision is added to this (Fig. 5778). Through these incisions, partly by sharp and partly by blunt dissection, in the intervesico-uterine connective-tissue plane, the lower aspect of the bladder is mobilized and pushed upward (Fig. 5779). The vesico-uterine peritoneal pouch is then incised laterally. This gains access to the now upwardly pointing infundibulum, or pathologic funnel of the uterus, lying within the peritoneum, with the appendigeal structures, tubes and ovaries, and sometimes a coil of small intestine entering the peritoneally lined funnel (Fig. 5780).

Fig. 5780.—The Same – III; – The bladder has been retracted upward – the site of the former vesico-uterine peritoneal pouch cut through – and the pathologic infundibulum of the inverted uterus exposed, with tubes and ovaries seen entering it. Scissors are medially dividing, on the anterior aspect, the free border of the cervix and the cervical tissue, up to the ring of constriction.

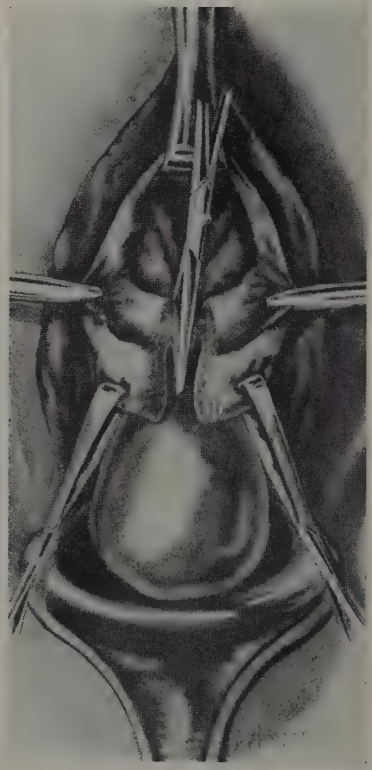


Fig. 5781.—The Same – IV; – The continuation of the anterior median scissor section, now downward, through the anterior wall of the body of the uterus.

The anterior median section of the uterus is now begun. Seizing the collar of cervix with two tenaculum forceps, the free margin of the cervix and as much of the cervix as is represented between the free border and the constricting rim of invagination of the uterine body through the cervix, is divided in the median line by stout, straight, blunt scissors (Fig. 5781).

At various stages of the section, and especially after the main constriction is divided, effort should be made, reasonably, to see if the uterus cannot be reinverted.

It frequently happens, however, that nothing can be accomplished until the section is continued down to the fundus (Fig. 5782).

The restoration of the normal relationship between uterine mucosa and serosa is best accomplished by digital reinversion, which is represented by a combination, after grasping the margins of the incised uterine wall with the fingers, of a rolling outward of the now inward serosa, and the indenting and pushing upward (as one does an everted glove finger) of the fundus of the prolapsed and inverted uterus (Fig. 5783).

Sometimes it is indicated to cut away an axial elliptic strip of a very thick infiltrated wall of a long-inverted uterus – which will often aid in the restoration of the parts, and in the suturing of the walls. Or a wedge-shaped, axially

Fig. 5782.—The Same – V; – The completed incisions are seen with the uterine adnexa visible within the still inverted uterus.

Fig. 5783.—The Same – VI; – The digital reinversion of the inverted uterus – throwing the serosa outward and the mucosa inward.

extending piece may be excised on each side, involving either part of the uterine wall and the mucosa, or part of the uterine wall and the serosa – usually the former.

When the reinversion has been accomplished, the incision which was originally made down the then anteriorly presenting inverted uterus, will now, of course, be posterior – but the cut margins are again made to present themselves (that is, face the Surgeon) when the reinverted uterus is thrown upward against the anterior vaginal wall – as seen in Fig. 5784. While held in this position two rows of chromic catgut sutures are placed to bring the opposite aspects of the split uterine wall into position – one, the inner buried row, passing through the innermost portion of the uterine wall, just avoiding piercing the mucosa at the margins – and the other passing through the outer

Fig. 5784.—The Same – VII; – The natural relationship of the mucosal and serosal surfaces of the uterus has been restored – and the uterus has been thrown upward and forward, against the anterior vaginal wall, so that the section now faces the Surgeon in the reversed position of the uterus. One tier of buried sutures unites the inner aspect of the uterine wall, just avoiding the mucosal margins – and the other, the deeper aspects, including the serosa.

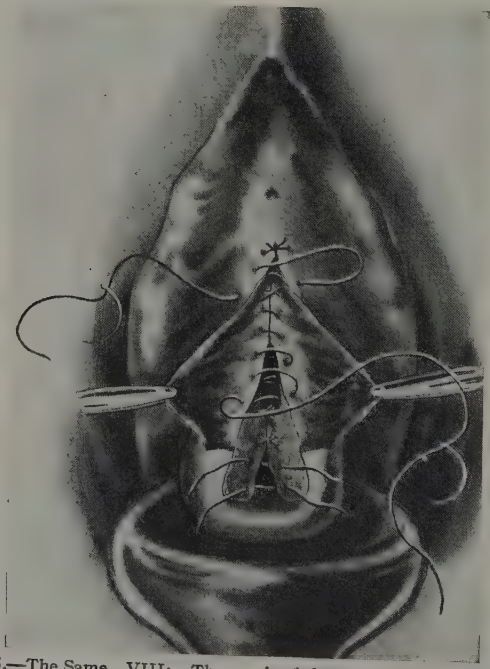


Fig. 5785.—The Same – VIII; – The repair of the cervix and the vaginal flaps.

aspect of the uterine wall and the covering serosa. The split cervix is similarly repaired _ and then the triangularly divided vaginal wall (Fig. 5785).

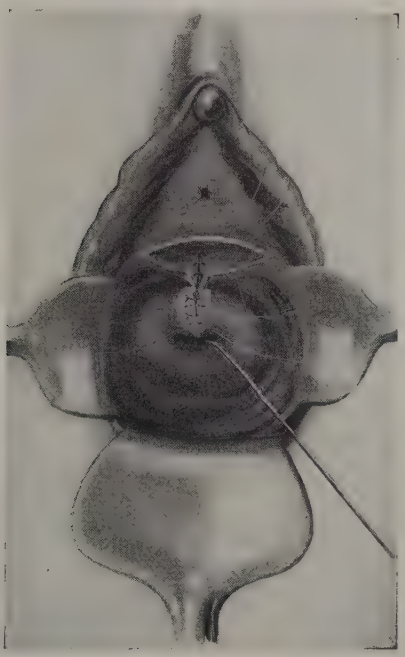


Fig. 5786.—The Same _ IX; _ The sutured wound.

Temporary drainage with rubber tubing is usually instituted through both the anterior and posterior vaginal fornices (Fig. 5786).

OPERATION FOR INVERSION OF THE UTERUS BY POSTERIOR COLPO-HYSTEROTOMY

KÜSTNER'S OPERATION

Description.—In this procedure the posterior vaginal fornix is incised and Douglas' culdesac opened. The inverted uterus is split down its posterior median aspect. It is then reinverted, sutured, and returned to the pelvic cavity _ after which the vaginal opening is closed.

Operation.—The inverted uterus and the vagina are well cleansed _ and sometimes the mucous aspect of the uterus, which is here outward, and often exhuberant with granulation in these cases, which are usually chronic, is curetted. If the inversion be incomplete, it is usually rendered complete, by traction upon the organ.

The completed inverted uterus is lifted upward by clamps _ and, while thus held, a transverse incision is made through the posterior vaginal fornix just below its insertion into the uterine neck _ and through this Douglas' posterior peritoneal cul-de-sac is opened (Fig. 5787, a). A short median incision may be extended up the vaginal wall. Through this opening the finger is introduced, and makes an exploration of the uterine infundibulum (formed of the serous aspect of the uterus), in which the tubes and ovaries are apt to be encountered, and sometimes a coil of intestine. Those structures which can be, and especially the intestines, are returned to the pelvic cavity.

The posterior median aspect of the uterus is then carefully incised with straight, blunt-pointed scissors, from and including the neck, as far toward the fundus as may be necessary – usually extending the entire way (Fig. 5787, **b**).

The reinversion or the inward turning of the uterine mucosa is now accomplished – by placing the thumbs upon the mucosal aspect of the uterine wall near the margins of the incised organ, and the fingers upon the serosal aspect, in the manner shown in Fig. 5789, turning the mucosa inward, and the serosa outward, as one turns the rind of an orange which has been split. This maneuver is usually readily accomplished.

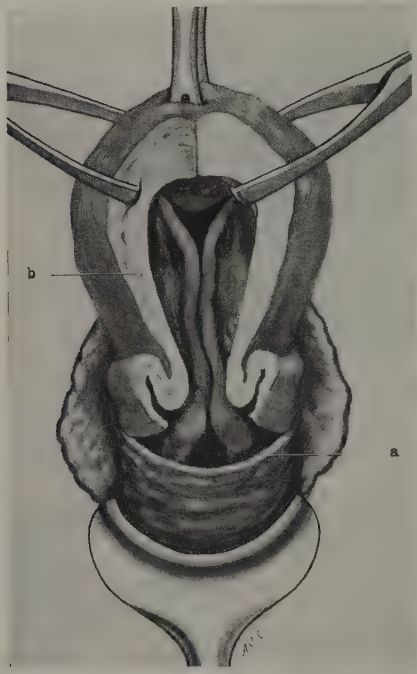


Fig. 5787.—Operation for Inversion of the Uterus by Posterior Colpohysterotomy – Küstner's Technic – I; – The posterior vaginal fornix has been incised transversely, **a**, and may be limitedly split axially – after which the posterior vaginal wall is split medially. The fundus of the uterus is drawn upward and forward.

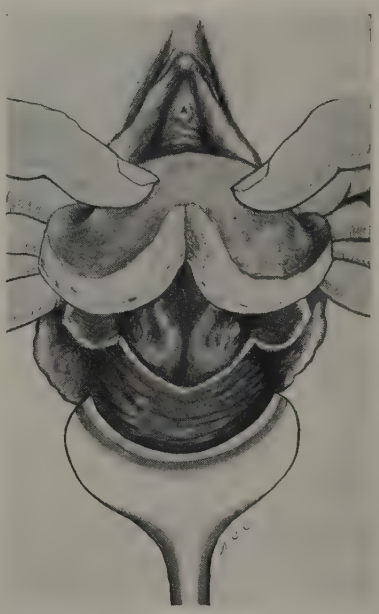


Fig. 5789.—The Same – II; – The split, inverted uterus is now reinverted – the mucosa, abnormally to the outer aspect, being turned back inward – and the serosa, with the appendages, outward.

The reinverted uterus now lies in the same position in which it does in vaginal hysterectomy, by a posterior incision, in which the fundus of the uterus is delivered through this posterior opening and is then carried forward. The posterior median incision of the organ is now uppermost – and the tubes, ovaries, and parts of broad ligaments lie outside, that is, in contact with the serosal aspects of the organ, as is normal (Fig. 5790).

While the uterus is held extended in this position two tiers of chromic catgut sutures are placed. The first either passing through the margins of the mucosa and part of the thickness of the uterine wall – or through part of the thickness of the uterine wall, without actually penetrating the mucosa. The former is probably nearly always used unless a diseased uterine mucosa might

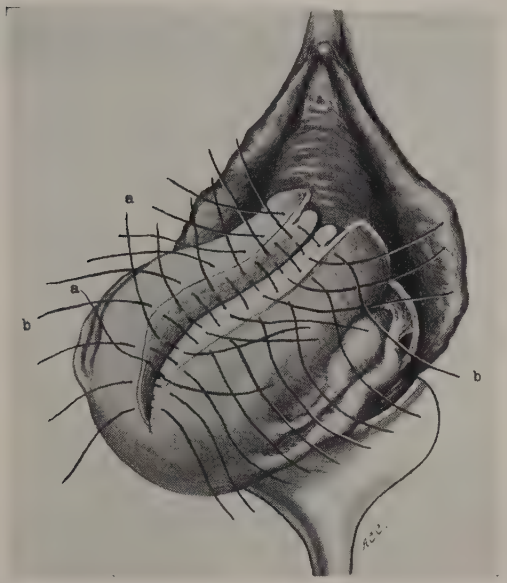


Fig. 5790.—III; _ The now reinverted uterus is being sutured _ by stitches, **a, a,** which avoid the mucosal margins and part of the uterine wall _ and others, **b, b,** which include most of the uterine wall and the serosa.

Fig. 5791.—IV; _ The reinverted and almost completely sutured uterus is being returned to the peritoneal cavity _ after which the suturing of the split cervix and the margins of the triangular vaginal incision are tied.

be considered likely to convey infection into the uterine wall. The second tier of chromic catgut stitches passes through the serosa and major portion of the muscular uterine wall (v. Fig. 5790, **b, b**).

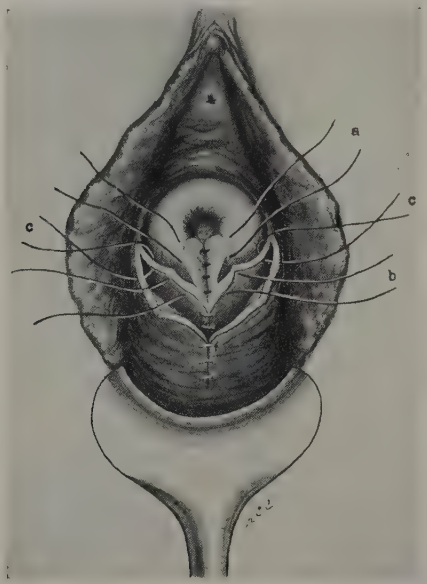


Fig. 5792.—V; – The reinverted uterus has been replaced – and the remaining loose sutures of the cervix and upper portions of the vaginal incision are being tied.

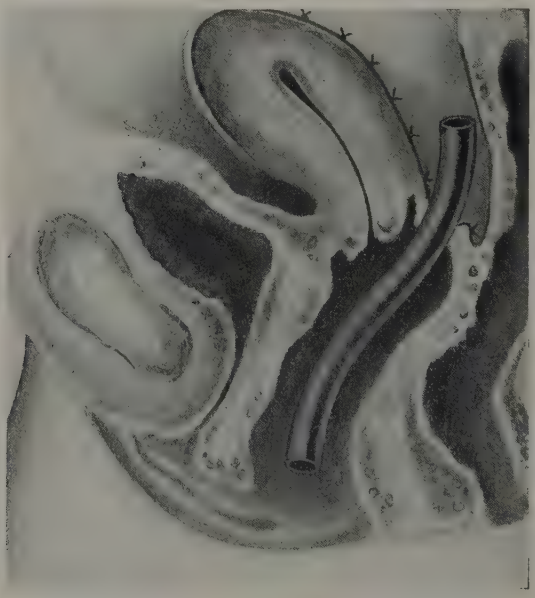


Fig 5793.—The Same – VI; – The completed operation.

At the completion of the suturing of the split uterus the now normal, reinverted uterus still protrudes through the posterior vaginal incision – its

fundus pointing downward, its cervix upward, its sutured posterior surface forward, its anterior surface backward — the uterine adnexa lying antero-laterally.

When the major portion of the uterine suturing has been completed — all save some of those at the cervix, and the ones to close the crucial vaginal incision, the margin of the vaginal opening are retracted, and the uterus is carefully returned to the pelvic intraperitoneal cavity through the opening in Douglas' culdesac — the fundus being pushed downward and upward, in turn, into its normal position (Fig. 5791).

There now remain to be tied the remaining stitches in the cervix and those in the margins of the transverse incision in the posterior vaginal fornix, with its upward median incision (Fig. 5792).

Temporary drainage of the retro-uterine, intraperitoneal space is usually instituted.

The appearance of the parts at the completion of the operation is as shown in Fig. 5793.

OPERATIONS FOR UTERINE MYOFIBROMATA BY THE VAGINAL ROUTES

The removal of uterine myofibromata, of even moderate size, by the vaginal route is rather the result of accidental contact with such conditions during the performance of some other operation by this route, rather than of choice of their removal through the vagina — and, even then, removal will largely depend upon the combined size of the uterus and the tumor, on the one hand, and upon the vagina, upon the other — for even a comparatively small tumor can only be removed through a reasonably roomy vagina.

Polypoid tumors and pedunculated submucous myofibromata are not here considered (v. p. 276).

Submucous fibromyomata are removed through the incised endometrium, usually after dividing the uterus, which may be accomplished extraperitoneally, but often necessitates the division of the peritoneum.

Interstitial and subperitoneal fibromyomata are removed through the incised peritoneal aspect of the uterus — the uterus usually being first exposed and delivered into the vagina through either an anterior or a posterior colpo-peritoneotomy incision.

Removal of Submucous Fibromyomata Uteri of the Anterior Wall by the Vaginal Route, After Anterior Median Cervicohysterotomy, Without Incision of the Peritoneum.—A median incision is made over the anterior median vaginocervical wall, after which the lower aspect of the bladder is carefully exposed and retracted upward from the cervico-uterine junction. The cervix is seized by two vulsellum forceps, one on either side of the median line, and, while these draw the organ downward, the cervix is divided in the anterior median line by means of stout, straight, blunt-pointed scissors, one blade of which passes into the cervical canal. When the canal has been divided in part of its length, it may be possible to pass a finger into the uterine cavity, especially if the internal os have been dilated — by which means further bearings of the case may be learned. To carry the incision higher and complete the operation extraperitoneally it may be necessary to expose and push the vesico-uterine peritoneal reflection higher up from the face of the uterus — and then extend the median incision of the organ — in order to reach a submucous tumor of intermediate height. The tumor is then enucleated — after which the cervico-uterine wall is closed by a double tier of buried chromic catgut stitches, and the incised vaginal wall by a third tier — or the closure may be accomplished by two tiers.

Removal of Submucous Fibromyomata of the Anterior Wall by the Vaginal Route, After Anterior Median Cervicohysterotomy and Incision of the Peritoneum.—The first portion of the operation here is, in effect, an anterior colpoperitoneotomy. After the bladder has been safeguarded and the peritoneum has been opened, the remaining steps of the operation are the same as those just described, except that the incision is extended even up to the fundus uteri if necessary. The necessary degree of exposure for such an extreme length of incision, however, will depend, combinedly, upon the mobility of the uterus, the upward freeing and retraction of the bladder, the downward traction of the uterus by the two vulsellum for-

Fig. 5794.—Removal of Submucous Fibromyomata of the Posterior Wall, by the Vaginal Route, After Incision of the Peritoneum and Median Cervicohysterotomy; – The cervix has been drawn far downward – the bladder held well upward – the anterior cervico-uterine wall medially split – and the mucosa incised over the tumor upon the posterior wall – after which the tumor will be enucleated.

ceps, and the upward traction of the upper retractor in the peritoneal opening. The anterior splitting of the cervix is then carried on up into the body of the uterus until the site of the tumor is reached – which is then enucleated as in the preceding method. The split uterine wall is closed by two tiers of chromic catgut stitches, the margins of the peritoneum united, and the vaginal wound sutured.

Removal of Submucous Fibromyomata of the Posterior Wall by the Vaginal Route, After Anterior Median Cervicohysterotomy and Incision of the Peritoneum.—The method here is, in principle, the same as that of either of the two just described, according to the proximity of the tumor to

the cervix or fundus, as the case may be – except that the anterior wall of the uterus is cut entirely through to gain access to the posterior wall. The mucosa is then incised over the tumor in the posterior wall, which is then enucleated in the ordinary manner (Fig. 5794). In concluding an operation of this type the incised posterior mucosa is first repaired – then the opposite anterior wall, with a double tier of sutures – and finally the peritoneum is sutured, if it has been incised – and the vaginal wound closed.

Removal of Interstitial and Subperitoneal Fibromyomata of the Anterior Wall of the Cervix and Cervico-uterine Junction by the Vaginal Route, by Anterior Median Division of the Overlying Portion of the Uterine Wall, Without Incising the Peritoneum.—This technic corresponds,

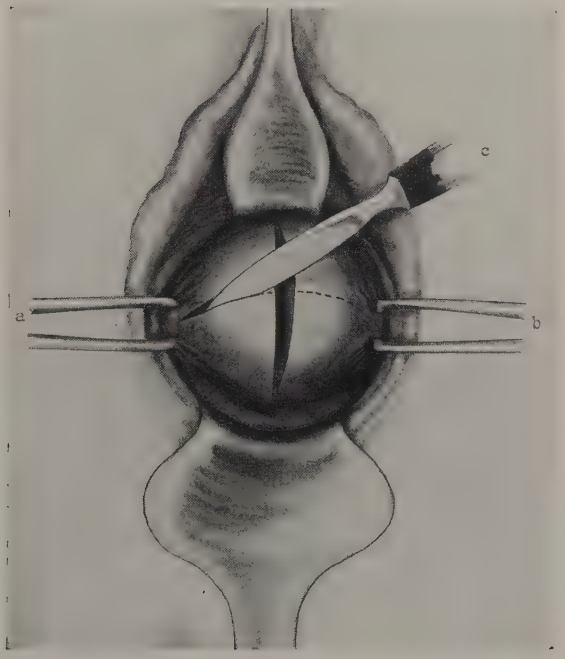


Fig. 5795.—Removal of Interstitial and Subperitoneal Fibromyomata of the Anterior Wall or Fundus of the Body of the Uterus by the Vaginal Route, Through Anterior Colpoperitoneotomy and Division of the Overlying Portion of the Uterine Wall – I; – The anterior wall of the body or the fundus of the uterus has been delivered into the vagina and steadied by volsella, while the uterine wall overlying the tumor is being crucially incised.

largely, with the first one of the three preceding procedures – and need not be further gone into here. It is simply a matter of incising somewhat less deeply into the anterior wall. In proportion as the tumor encroaches upon the body of the uterus will the technic take on the character of the following operation.

Removal of Interstitial and Subperitoneal Fibromyomata of the Anterior Wall or Fundus of the Body of the Uterus by the Vaginal Route, Through Anterior Colpoperitoneotomy and Division of the Overlying Portion of the Uterine Wall.—The early stages of this method are precisely those of an ordinary exposure through the anterior vaginal fornix (v. p. 372). A finger introduced through the opening into the peritoneal cavity thus made will determine the position and other features of the tumor – es-

pecially as to adhesions and as to its probable removability by this route. If these be favorably decided, the tumor of the anterior wall is brought into manipulable position – by delivering as much of the tumor and neighboring uterus through the anterior colpoperitoneotomy incision, into the vagina as may be indicated, where it is steadied (and kept from retracting backward) by vulsellum forceps. A median, lateral, or, usually, crucial incision is then made through that portion of the uterine wall which intervenes between the presenting surface and the tumor (Fig. 5795). The tumor is then seized by another pair of vulsellum forceps and, while thus held, is enucleated from its bed – partly by blunt dissection and partly by the snips of curved, blunt-pointed scissors (Fig. 5796). The uterine wall thus incised, as well as the bed of the tumor, are brought together by buried sutures of chromic catgut – the peritoneum closed – and the vaginal wound sutured.

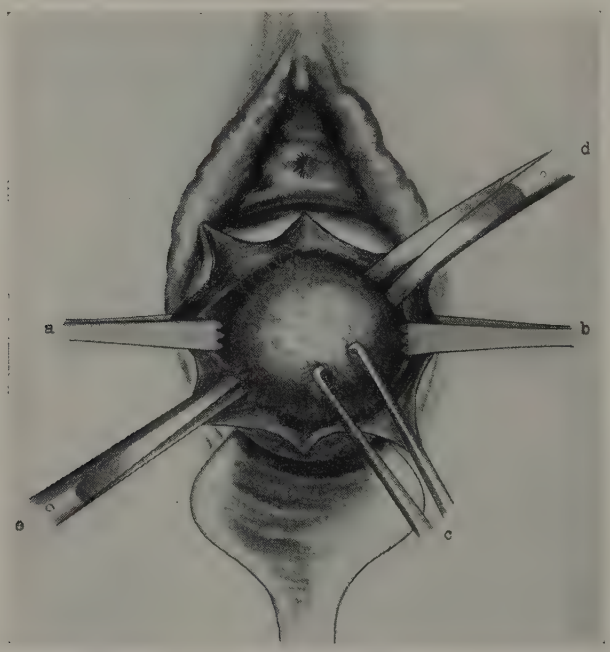


Fig. 5796.—The Same – II; – The tumor is being enucleated chiefly by blunt dissection while being held by forceps.

Sometimes, especially in dealing with tumors of the fundus, the entire body of the uterus is delivered outside of the vagina through the anterior colpoperitoneotomy opening – after which the tumor of the fundus, or its neighborhood, is treated in the same general manner as just described. In Fig. 5797 such a tumor is being spooned from its bed – after which the walls of this bed will be closed by suture.

Removal of Interstitial and Subperitoneal Fibromyomata of the Posterior Wall of the Body, or Fundus, of the Uterus by the Vaginal Route, Through Posterior Colpoperitoneotomy and Division of the Overlying Portion of the Uterine Wall – or After Splitting the Antero-uterine Wall and Incising the Posterior Wall Through the Uterine Cavity.—It will be a matter of judgment as to which one of these two technics will be adopted in the individual case. It may happen, especially in a backwardly

displaced uterus and roomy vagina, that delivery of the uterus and tumor through an incision into the peritoneal cavity, through the posterior vaginal fornix, may be readily accomplishable – and, in such instances, should be carried out. In other instances, especially where the opposite conditions exist, the only course which may be available may be to expose the uterus in the vagina, through an anterior colpoperitoneotomy incision – and then, after medially incising the anterior wall of the uterus and entering the uterine cavity, cut through as much of the posterior wall of the uterus as may be required to reach the tumor. The tumor is then enucleated – its bed and the posterior uterine wall repaired by suture – the anterior uterine wall sutured – and the peritoneal and vaginal incisions closed.

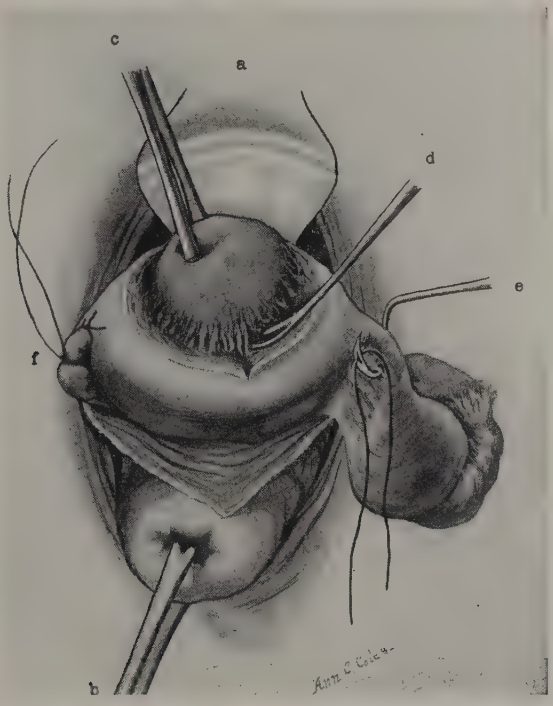


Fig. 5797.—Removal of an Interstitial or Subperitoneal Fibromyoma of the Fundus of the Uterus After Delivery of the Uterus Into the Vagina Through an Anterior Colpoperitoneotomy Incision; – The tumor is being spooned from its bed, which will be subsequently repaired by suture. Bilateral double ligation, with partial excision of the tubes, is being carried out for complete sterilization.

Removal of Uterine Fibromyomata by Morcellation Through the Vaginal Route.—The removal of these tumors by morcellation is occasionally indicated. And this may be sometimes accomplished without opening the peritoneal cavity – after a median incision of the anterior vaginocervical wall, with upward displacement of the bladder and vesico-uterine peritoneal reflection. The cervix or cervix and cervico-uterine junction may then be medially divided – or windowed (by limited bilateral incisions) (Fig. 5798) after which the fibromyoma is centrally cored, and then removed piece-meal – or, after removing a certain portion of the tumor in this fashion, it may be possible, and indicated, to deliver the uterus, with the remaining portion of

the tumor, into the vagina – and there complete the removal – after which the uterus may be repaired and returned to the abdomen – or the damage may

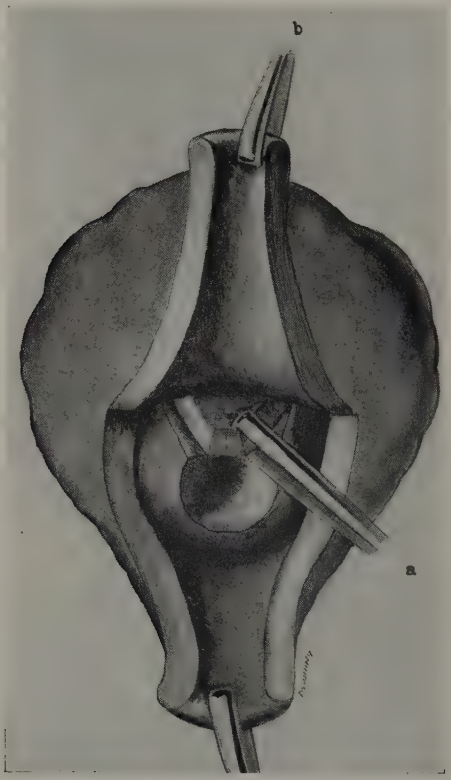


Fig. 5798.—Diagrammatic Illustration of the Method of Removing a Uterine Fibromyoma by Morcellation Through a Windowed Opening of the Lower Aspect of the Uterus Subperitoneally.

have been so great as to indicate the necessity of performing vaginal hysterectomy.

OPERATIONS UPON THE FALLOPIAN TUBES AND OVARIES BY THE ANTERIOR AND POSTERIOR VAGINAL ROUTES

It is rather in the encountering of certain conditions of the tubes and ovaries, during the exposure of the peritoneal cavity by the vaginal routes, that such conditions (appropriate for correction by these routes) are discovered to be repaired – rather than that the exposure for the investigation and treatment of these conditions is deliberately undertaken by the vaginal, in preference to the abdominal, route. Neither is as full investigation and as careful technic possible in the former.

As the ovaries and tubes lie in the upper aspects of the broad ligaments (the tube anterior to the ovary), when these structures, and the uterus, are in normal position, and non-adherent, they are more accessible through an anterior vaginoperitoneotomy incision. As a rule, therefore, approach and delivery of these structures is by the anterior route – as the one of choice (Fig. 5799).

When, on the other hand, these structures, through pathologic conditions, are displaced posteriorly, especially if bound by minor adhesions (for firm adhesions would contraindicate application of the technic), approach through a posterior vaginoperiotneotomy incision will often give better access (Figs. 5800 and 5801).

If the Surgeon be of the mind that such operations are more the result of accidental contact, during the conduction of some other procedure, rather than of deliberate planning, it will usually amount to his endeavoring to make

Fig. 5799.—Final Delivery of the Uterus and Its Adnexa Through Posterior Vaginoperitoneotomy; – The right tube and ovary are being drawn into the vagina by forceps. The left tube and ovary have been delivered and a small cyst removed from the ovary, the wound in which is being sutured.

Fig. 5800.—Initial Step in Delivery of Uterus and Its Adnexa Through Posterior Vaginoperitoneotomy; – The fundus being either grasped by forceps or delivered by the fingers.

use of whichever route of exposure happens to have been made as the initial step, before discovering the condition calling for the special operation.

Where delivery of the uterine adnexa is contemplated, the anterior median vaginal incision should be fairly long – the bladder well separated from the cervix, especially more laterally than might otherwise be indicated – the margins of the incised peritoneum controlled by thread tractors – and an upper vaginal retractor passed into the peritoneal cavity. The uterus is grasped, through this opening, with uterus-holding forceps and delivered into the vagina. This act will tend to rub away minor adhesions, and others of moder-

ate grade may often be removed by a gauze-covered finger, or a gauze-mop in a holder. The tubes and ovaries sometimes fully and readily present with the delivery of the fundus, especially in large, relaxed vaginæ, and with small uteri _ and, at other times, must be delivered by the finger or forceps. The uterus may be moderately twisted upon its long axis, to bring either horn uppermost. Sometimes the special structure, tube or ovary, is seized with special forceps, and the uterus and opposite adnexa returned to the cavity, while leaving the special structure alone in the field more accessible to manipulation. At the end of this class of operations, which are usually conservative in nature, the structures are returned to the abdomen, the peritoneal and vaginal wounds closed _ unless, in exceptional cases, drainage of the site be indicated.

Fig. 5801.—Oöphorectomy and Salpingostomy Through Posterior Vaginoperitoneotomy: _ a, Volsellum forceps grasping the fundus; _ b, ligament of the right ovary being tied preparatory to excision; _ c, salpingostomy of the left tube.

The same general features obtain, whether operating by anterior or posterior colpoceliotomy _ with the necessary modifications required by anatomic conditions.

Partial Oöphorectomy for Small Ovarian Cysts by the Vaginal Route.—In the case of ovaries studded with several small cysts all that may be needed is to lay these open by simple incision, catching the escaping fluid upon gauze. Where one or two cysts of very moderate size are present, especially if involving more than the surface of the ovary, one may excise the little tumor, unopened, by a wedge-shaped incision _ and then bring the opposite walls of the incision together by a few fine catgut stitches (Figs. 5802 and 5803 _ and v. Fig. 5801).

Salpingostomy by the Vaginal Route.—The fimbriated extremity of the fallopian tube may be so obliterated by adhesions or other pathologic

condition that its canal may cease to be patulous, and, therefore, unable to conduct ova. The end of the tube may be transversely or obliquely excised (the latter leaving a larger opening) — after which the margins of the mucous lining and serous covering are brought together with fine catgut (Figs. 5801 and 5802).

Partial Salpingectomy for Sterilization by the Vaginal Route.—In cases where future pregnancy is contraindicated it is often indicated to render this impossible by doubly ligating both tubes (the operation must be bilateral), and then excise the portion of the tube between the ligatures (Fig. 5804). Where partial excision has not followed ligation, the tube has been known to

Fig. 5802.—Partial Ovariectomy and Salpingostomy, by the Vaginal Route, Through Anterior Vaginoperitoneotomy; — The tube and ovary have been alone delivered — or the uterus has been delivered and returned, and the tube and ovary retained.

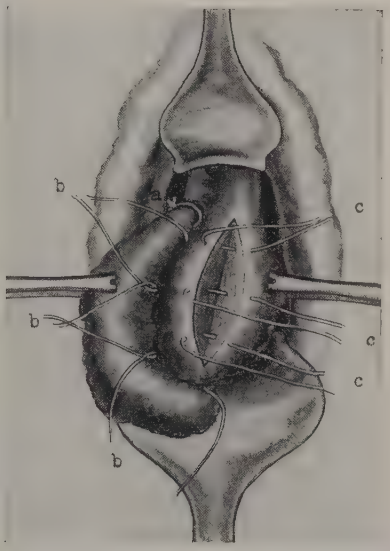


Fig. 5803.—Excision of the Outer Part of a Tube and of an Ovarian Cyst Through Anterior Vaginoperitoneotomy; — The ovarian cyst has been excised, wedge fashion, and sutures are placed, **c, c,** ready to close its bed. The tube has been ligated at its outer third, **a** — the distal portion being about to be excised — its bed to be closed by the sutures, **b, b, b,** here shown in the positions in which they will be placed after the excision.

sometimes become patulous subsequently and transmit ova. To prevent oozing it is safer to suture or ligate the site of the excision.

Partial Salpingectomy of the Distally Distended End of a Fallopian Tube by the Vaginal Route.—The distal end of a distended tube may be ligated and the portion beyond the ligature excised — with closure of the bed by sutures (v. Fig. 5804).

Total Oöphorectomy by the Vaginal Route.—If a hopelessly involved ovary be encountered in the course of transvaginal work, it may be excised along the same general lines as when exposed by the abdominal route. The ovarian artery reaches the ovary through the infundibulopelvic ligament. This ligament is ligated, as well as the ligament connecting the ovary with the uterus — after which these structures are divided and the ovary removed

– the bed from which it was excised being repaired by suture (v. Fig. 5801, where the technic is partly shown).

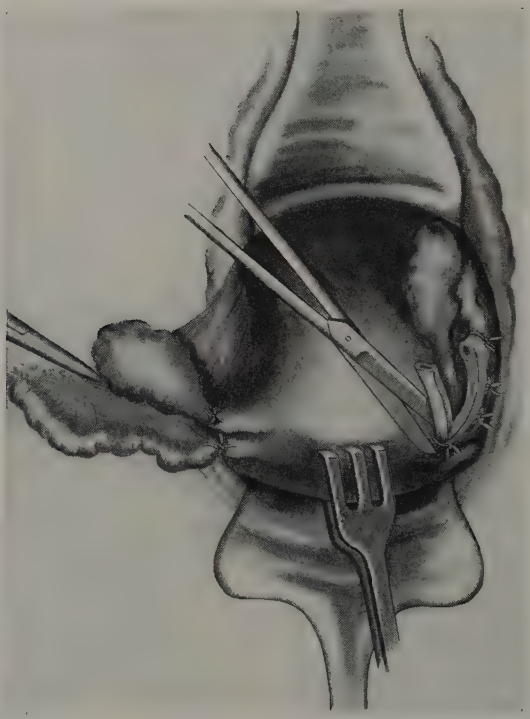


Fig. 5804.—Operations Upon the Uterine Adnexa, by the Vaginal Route, Through an Anterior Vaginoperitoneotomy Incision; – The uterus has been delivered through the anterior wound and depressed against the floor of the vagina. The ligament of the right ovary and the base of the right tube have been ligated, preparatorily to excising these structures. The left tube is being sterilized by partial excision between double ligatures – the underlying portion of the broad ligament being ligated.

The above technical procedures are more frequently carried out through the abdominal route, where they will be found described at greater length (v. Chap. XCI).

OPERATIONS UPON OVARIAN CYSTS BY THE VAGINAL ROUTES

The abdominal route is the one of choice, and the vaginal the one of exception for any of the operations upon ovarian cysts – accidental encounter during the course of some other operation being the chief indication or excuse for choosing the latter route.

Only accessible and deliverable cysts of moderate size, without adhesions, occupied by thin fluid, and in roomy vaginæ, thus (accidentally) encountered, should be attacked through the vagina. The methods of operating are either evacuation of fluid and excision of the sac – or by evacuation of the fluid and anchorage in the vaginal wound of the remains of the partially excised sac. The former procedure may be carried out through either the anterior or posterior vaginal routes – but drainage of the sac is always conducted through the posterior fornix.

Evacuation and Excision of an Ovarian Cyst Through an Anterior or Posterior Colpoperitoneotomy Incision.—Approach may be made de-

liberately by either an anterior or posterior colpoperitoneotomy incision – or the cyst may prove an accidental discovery following the exposure of the peritoneal cavity by either one of these routes. Upon entering the cavity, the feasibility of operating upon the cyst by this route must be determined by digital examination of its surroundings, especially as to adhesions. If this be decided favorably, an attempt may be made to deliver a cyst of moderate size through the incision in the fornix. If it be too large for this, it is manipulated – both digitally from within the abdomen and by pressure from without, until a convenient portion of its wall can be pressed into the vaginal opening, or brought opposite the vaginal incision, when this portion of the wall is seized

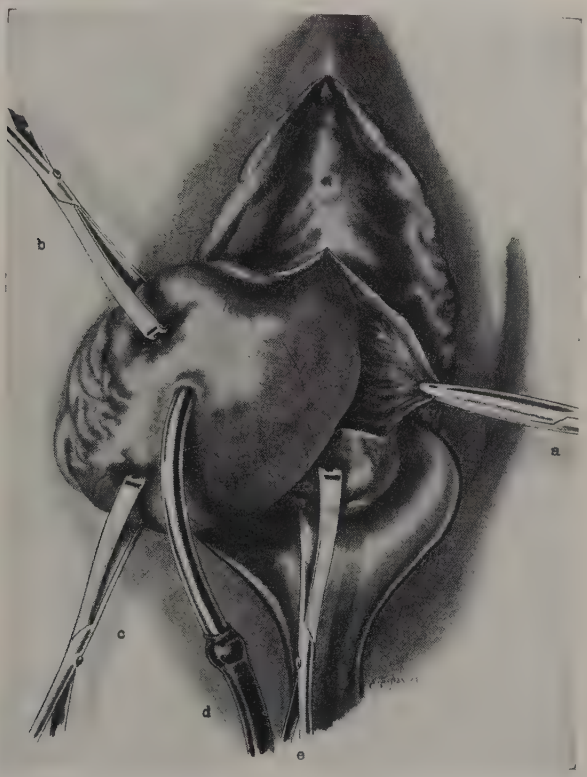


Fig. 5805.—Evacuation and Excision of an Ovarian Cyst Through an Anterior Colpoperitoneotomy Incision – I; – The cyst, grasped by two vulsellum forceps, has been drawn through the incision in the posterior fornix and is being evacuated by trocar and cannula.

by two non-traumatizing clamp forceps, and either steadied in this position, or drawn partly through the opening. While thus held, an evacuating trocar is carried into the cavity of the cyst, and its fluid contents evacuated (Fig. 5805), carefully maintaining the holds of the forceps upon its wall the meantime – and drawing the collapsing sac from the cavity *pari passu* with its evacuation – until its pedicle is reached. Sometimes the uterus and appendages are delivered in the latter stages. Finally, the pedicle is ligated with a stout ligature (Fig. 5805) and the tumor excised.

Evacuation and Drainage of an Ovarian Cyst Through a Posterior Colpoperitoneotomy Incision.—The cases in which this method is applied

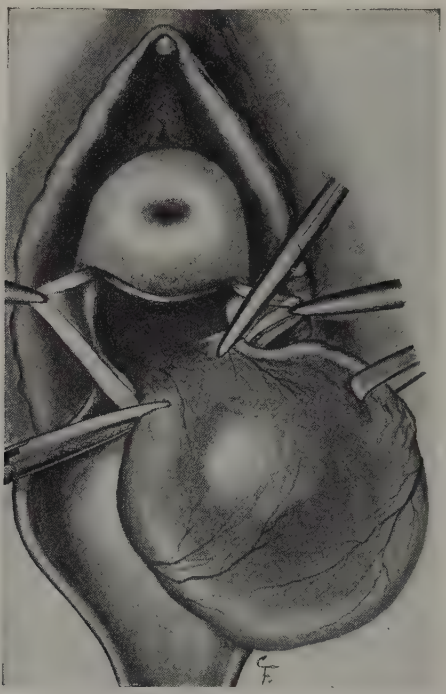


Fig 5806.—Evacuation and Drainage of an Ovarian Cyst Through a Posterior Colpoperitoneotomy Incision – I; – The cyst has been delivered into the wound and evacuated, as in the preceding operation – and its excess is about to be excised.

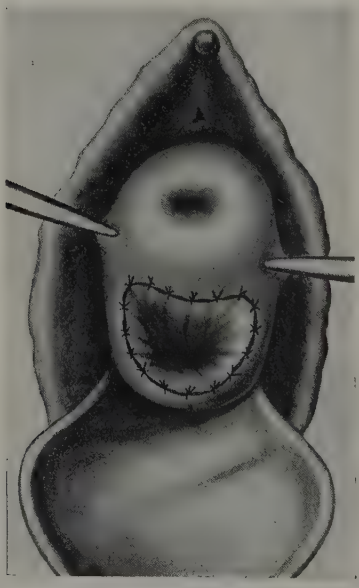


Fig. 5807.—The Same – II; – The margins of the remaining portion of the ovarian sac are stitched to the margins of the incision in the posterior vaginal fornix.

are usually those in which the cyst cannot be eventually, even after evacuation, brought sufficiently into the vagina to enable the pedicle to be ligated and the cyst wall excised. It should first be brought as far into the wound as possible grasped, and evacuated (Fig. 5806) – after which as much more of the empty cyst wall should be drawn out as may be rendered additionally possible by evacuation. The excess of this wall is then excised, carefully clamping the proximal portion, to prevent escape into the cavity – after which the margins of the remaining portion of the cyst wall left after excision is sutured to the margins of the incision in the posterior vaginal fornix (Fig. 5807). The cavity of the remaining part of the cyst is then wiped out with a gauze mop held in a long clamp, and the cavity packed with strips of gauze, to promote inflammatory reaction, with the adhesion of the opposite surfaces of the sac and obliteration of the cavity.

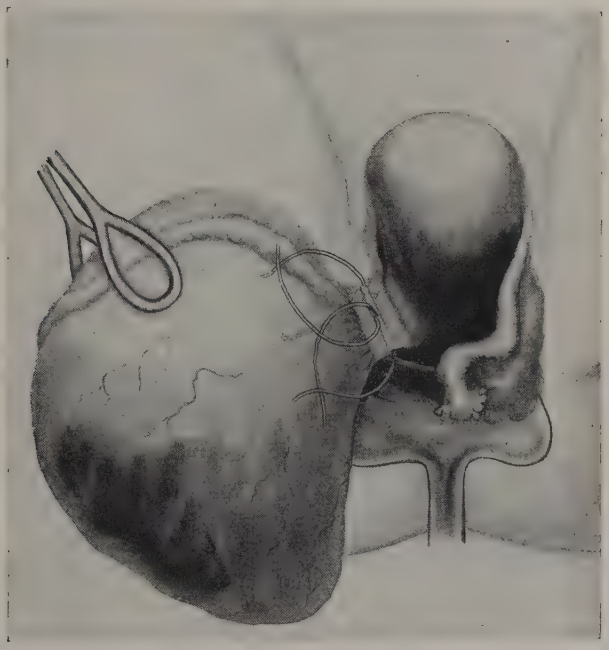


Fig. 5808.—Vaginal Ovariectomy Through a Posterior Vaginoperitoneotomy Incision

In Fig. 5808 an ovarian cyst is being removed after delivery of the uterus and adnexa through a posterior colpoperitoneotomy incision.

SUPRAVAGINAL AMPUTATION OF THE CERVIX UTERI BY THE VAGINAL ROUTE

Total amputation of the cervix uteri is called for in such cases as those of extreme laceration (in which less extensive measures may be impossible), hypertrophy, cystic degeneration, in some cases of prolapsus uteri and the like.

Amputation of the entire cervix is sometimes performed in cancer, where, for some reason, the more radical operation is contraindicated – but, where this is not the case, the radical removal of the entire uterus is usually indicated.

The operation may or may not require the opening of the peritoneum.

Preparation _ Position _ Landmarks.—As in the partial amputation of the cervix.

Operation.—The cervix is drawn well down and out of the vaginal canal. It is conveniently seized by one pair of vulsellum forceps in the anterior lip, and another in the posterior (or stout double thread tractors may be used). A circular incision is then carried around the free aspect of the cervix, just above its face, considerably below the junction of the cervix with the vagina, passing through the mucosa and into the connective-tissue plane. The cervicovaginal wall is then freed in the connective-tissue plane, being pushed and rolled upward, chiefly by blunt dissection, accomplished by a gauze-covered finger, or by a blunt dissector, aided, here and there, by scissor snips _ the

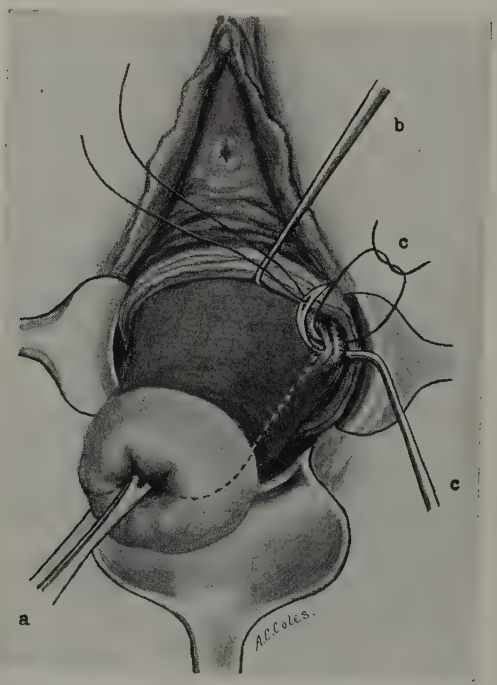


Fig. 5809.—Supravaginal Amputation of the Cervix Uteri by the Vaginal Route _ I; _ Following a circular division just above the face of the cervix, the cuff of cervicovaginal tissues, including the bladder, have been freed upward to just above the level of intended section. The uterine vessels are being doubly ligated. The peritoneum may or may not be opened.

cervix being held, the meantime, drawn well downward and outward. This upward separation of the cervicovaginal cuff is more readily accomplished anteriorly and posteriorly than laterally, the presence of the uterine vessels here interfering. The anterior cervical wall is to be closely hugged, upon this aspect, so that the bladder will be exposed to a minimum risk of damage at this stage. The upward freeing of the cervicovaginal coverings is continued until the bared cervix is exposed for an upward distance of about 5 to 6 cm. (2–2⅜ inches). It is in the upper limits of this freeing that the uterine vessels of each side are sought, coming mediad, between the layers of the broad ligaments, to the lateral aspects of the neck of the uterus. By means of an aneurysm needle double chromic catgut ligatures are carried around these vessels and tied, and the vessels divided between (Fig. 5809) (v. Comments). During these steps the

vesico-uterine reflection of peritoneum may or may not have been opened. It may be possible to push it on up ahead of the field of operation, unopened – rolling it onward with the finger-tip, with the rest of the structures. But if, on the other hand, its incision be indicated, in the progress of the operation, for better, or higher exposure, this is carried out – followed by subsequent suture of the opening, before the conclusion of the operation.

When the cervico-uterine junction has been freed sufficiently high, and the uterine vessels controlled by ligature and divided, amputation of the cervix is performed – which is begun by bilateral splitting of the cervix (Fig. 5810). While this is being done the cuff of tissues is held well retracted – up just beyond the highest limit to which the splitting is to be carried. The split lips of the cervix are held by vulsellum forceps, and before their transverse section is carried out provision is made to prevent the proximal aspect of the stump from retracting within the cavity, out of reach. This may be accomplished by passing a stout, double-silk, temporary tractor through each lip, above

Fig. 5810.—The Same – II; – The cervicovaginal cuff is retracted. The cervix has been bilaterally split – and each half-lip will be amputated in wedge-shaped fashion.

the site of transverse section. The transverse division may be made in one of two ways. Each half-lip of the cervix may be excised in wedge-shaped fashion, leaving a V-shaped excavation in each half-lip, the secondary lips of which will lend themselves to approximation by suture (v. Fig. 5810). Or the cervix may be first transversely amputated from the body of the uterus, at a right angle to its axis, and then this flat face of cervix may be excavated, in trough fashion, subsequently to the transverse section. The ultimate effect by both methods is about the same.

Finally, the peritoneal cavity is closed by suture, if it have been opened – and provision made for covering over the face of the cervical stump. The general method of procedure followed to this end, irrespective of the detail of the amputation, is to bring, in the anterior median line, the margin of the anterior vaginal wall flap into contact with the margin of the mucosal lining of the anterior aspect of the remains of the cervico-uterine canal – and to bring, in the posterior median line, the margin of the posterior vaginal wall flap into contact with the margin of the mucosal lining of the posterior aspect

of the remains of the cervico-uterine canal — which is usually accomplishable by two or three sutures above and the same number below. The rest of the cervical surfaces, lying to right and left of the limits of the margins of contact of the vaginal mucosa with the mucosa of the uterine canal, are covered by bringing together, over them, the opposite margins of anterior and posterior vaginal mucosa.

Comments.—All bleeding vessels should be carefully ligated with catgut before suturing the vaginal flaps over the amputation stump. The final suturing of the wound will also be hemostatic.

It should be calculated, at the completion of the operation, that the new cervical canal is at the apex of the face of the cervix — and not in a depression.

As a rule the amputation of the cervix should not be made at a higher level than 1.2 cm. ($\frac{1}{2}$ inch) below the internal os. The uterus is usually unable to retain a developing fetus if much of the cervix be sacrificed. Or the contraction of the scar tissue may obstruct labor.

The sutures which unite the mucosal tissues over the stump should take a good hold upon the underlying muscular tissue — and should be of fairly stout twenty- or thirty-day chromic catgut.

Sometimes after amputating the first half-lip, while the second half-lip is being held by vulsellum forceps, the median portion of the bed left by this half-lip amputation is sutured, and the temporarily left long suture ends used as tractors while the second half-lip is being amputated.

Instead of preliminarily tying the two uterine arteries, one may simply clamp the vaginal branches of these arteries as they are cut, and then tie them — thereby not interfering with the blood-supply which passes from the uterine arteries to the body of the uterus — a course which has much to recommend it.

Better approximation of the tissues upon the cervical aspects of the stump may sometimes be secured if the muscle tissue of these aspects be cut in the form of a shallow groove (v. Fig. 5810).

It is desirable that there should be at the end of the operation some slight projection of the stump tissue into the vagina — rather than that the stump should be flush with the vault of the vagina.

A combination method of bilateral flap formation and transverse section may be adopted — upon the plan carried out in amputating the limbs. The anterior and posterior flaps will then consist of mucosa and part of the muscular thickness — these are then freed backward (upward) and, on the level of their retracted bases, the rest of the circular tissues are circularly divided. These flaps are then brought down and sutured over the face of the stump — restoring the cervico-uterine canal by suturing mucosal margins together. In this method of procedure the bladder attachment to the cervix is turned backward with the elevation of the anterior flap.

Bleeding from the cervical arteries can usually be controlled by a ligature passed on each side beneath the vessels.

If the vaginal mucosa, anteriorly and posteriorly, be united to the mucosa of the remains of the cervico-uterine canal, obliteration of the canal need not be feared. Some Surgeons, however, keep the canal lightly packed with gauze for a couple of days.

PARTIAL EXCISION OF THE FUNDUS UTERI BY THE VAGINAL ROUTE

Description.—Cases may present themselves in which, during operation, a uterus is encountered — as, for instance, in removing fibromyomata — which is considerably enlarged, and in which it may be indicated to remove a portion of the body of the organ. It may also happen that considerable

mutilating damage may have been committed upon the viscus, in the way of penetrating its walls, or otherwise, in the removal of such tumors, independently of enlargement, so that it is wise to excise a part of the organ – without sacrificing it in its entirety.

Or, again, the size of the organ may be diminished – and, if present, a very much diseased mucosa may be gotten rid of – by excising the mucosal lining of the entire cervico-uterine cavity, in addition to excising a vertical strip of uterine tissue.

Measures to these ends will be here briefly described – being modifications of the same technics involved in the vaginal excision of the entire uterus.

Fig. 5811.—Vaginal Excision of a Wedge-shaped Portion of the Fundus of an Enlarged or Damaged Uterus Encountered in the Progress of Operation – I; – A cuneiform portion of both walls of the fundus uteri, of the vaginally delivered organ, is being excised by knife or by scissors.

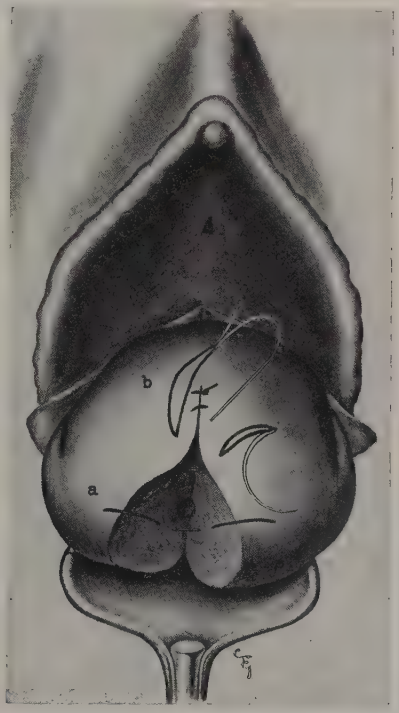


Fig. 5812.—The Same – II; – Restoring the uterus by sutures which penetrate the entire thickness of its walls, with the exception of the mucosa.

Vaginal Excision of a Wedge-shaped Portion of the Fundus of an Enlarged or Damaged Uterus Encountered in the Progress of Operation.—The steps of the operation, up to the delivery of the uterus into the vagina, are exactly the same as those for Total Vaginal Hysterectomy of the Intact Uterus in its Reversed Axis (v. p. 471). Having delivered the organ through an anterior colpoperitoneotomy incision, a long-bladed, rubber-covered, non-traumatizing clamp is placed over the free border of each broad ligament and extending downward toward the cervix, to temporarily control the bleeding. A cuneiform portion of the body of the uterus is then excised – either

by knife or by stout scissors (Fig. 5811). If there be any visible bleeding vessels upon the cut margins, these are tied with fine catgut. The opposite raw walls are then brought together by chromic catgut sutures which penetrate all of their thickness except the mucosa (Fig. 5812). The uterus is then returned to the pelvic cavity and the peritoneovaginal opening closed in the usual manner _ or temporary drainage established, as may be indicated.

Vaginal Excision of a Vertical Strip of the Entire Enlarged or Damaged Uterus, Including Its Mucosa _ as May Be Encountered, and Indicated, in the Course of Operation.—Instead of decreasing the size o an enlarged uterus in the manner just described, the bulk of the organ may be

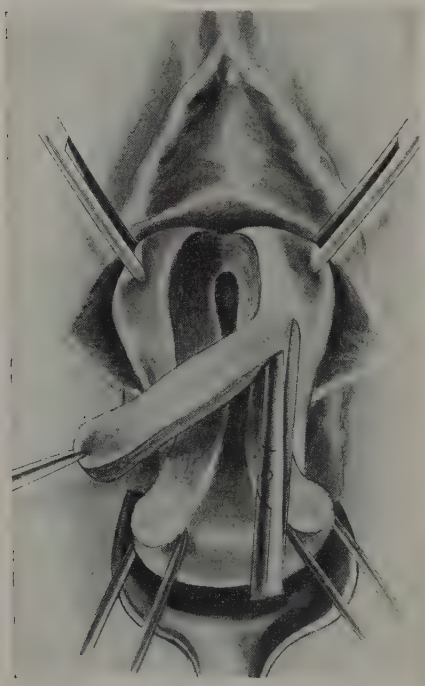


Fig. 5813.—Vaginal Excision of a Vertical Strip of the Entire Enlarged or Damaged Uterus, Together with the Entire Mucosa of the Organ _ as May be Encountered, and Indicated, in the Course of Operation _ I; _ The anterior wall of the uterus has been split with scissors _ and a strip of cervico-uterine tissue is being excised from each margin of the wound.

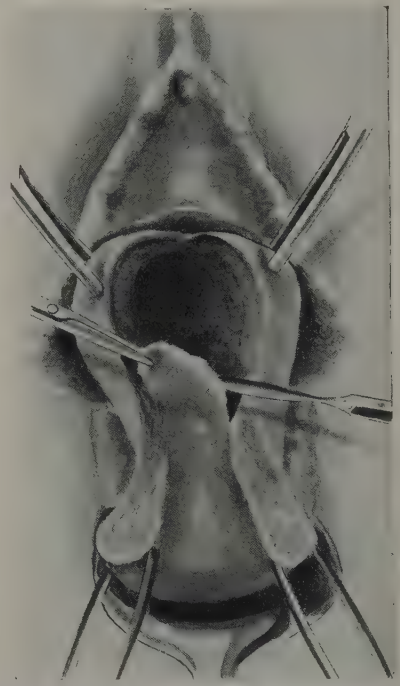


Fig. 5814.—The Same _ II; _ Excision of the uterocervical mucosal lining.

diminished by removing a vertical strip of its entire thickness from the center of its anterior wall, and, at the same time, the mucosal lining of the entire uterocervical cavity. The delivery of the uterus is accomplished as in the preceding technic, just described (v. Total Vaginal Hysterectomy of the Intact Uterus in its Reversed Axis, p. 457). After temporarily clamping the broad ligaments in the manner described immediately above, the anterior wall of the uterus is medially split with stout scissors from cervix to fundus (Fig. 5813). After this as much of an additional strip of uterine tissue is removed from each side of the median section as may be deemed sufficient for the indicated diminishing of the bulk of the organ. Finally, the utero-

cervical mucosa is seized with forceps and entirely dissected away with curved scissors (Fig. 5814). The raw surfaces of the uterine cavity are then brought together by one or more tiers of buried chromic catgut sutures (Fig. 5815)

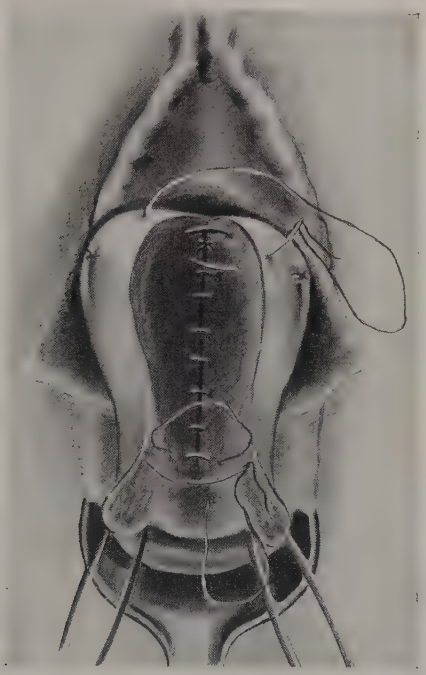


Fig. 5815.—The Same — III; — Suturing together the opposite raw cervico-uterine surfaces by buried sutures — followed by the approximation and suturing of the opposite borders of the remaining anterior uterine wall.

and a last row of sutures brings together the split uterocervical wall. The peritoneovaginal wound is closed, or drained, in the usual manner.

VAGINAL HYSTERECTOMY, IN GENERAL

There has been much controversy as to the relative value of hysterectomy by the vaginal and by the abdominal routes. It may be said — in general terms — that vaginal hysterectomy, in the estimate of many Surgeons, including the view of the Author, occupies a secondary position as compared with abdominal hysterectomy — and chiefly for the reasons that it is applicable to fewer conditions in which hysterectomy is indicated — that other intrapelvic conditions cannot be definitely known in operating by the vaginal route — that few of such accompanying conditions can be as satisfactorily dealt with, as in operating by the abdominal route, and some, not at all — that, technically, the details of the excision cannot be as accurately or as surgically carried out by this contracted route as through the opened abdomen (the operation sometimes having to be entirely abandoned) — and, finally, that the danger of wounding adjacent structures is greater, especially in difficult cases, in operating by the vaginal route. In specific instances, on the other hand, removal of the uterus by the vaginal route is the operation of choice.

As fairly showing the range of opinion as to the status of hysterectomy by the two routes — as well as indicating the scope and indications of the vaginal

excision – the expressions of view of several practical gynecologic Surgeons will be given:

"The most suitable cases for vaginal hysterectomy are those in which the uterus is but little (if at all) enlarged, the cervix healthy, and the vagina capacious. These conditions necessarily restrict the indications, but we may cite cases of fibrosis, and the very rare cases in which hysterectomy is required for dysmenorrhea. Formerly this operation was the one of election for carcinoma of the cervix; and, as has been stated, it has been practised for fibroids; but in both of these conditions the majority of experienced Surgeons now prefer the abdominal route; and even for cases of fibrosis and dysmenorrhea the abdominal route is better." – Arthur E. Giles.

"As compared with properly executed abdominal hysterectomy, the extirpation of the uterus *per vaginam* has no advantages. It cannot be done

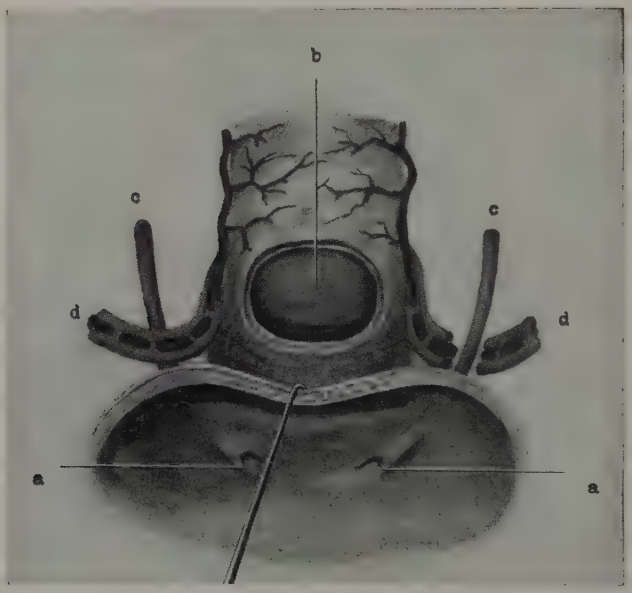


Fig. 5816.—Relations of the Ureters and Uterine Vessels to the Neck of the Uterus and Base of the Bladder – (seen from in front and above): – a a, Vesical opening of the ureters; – b, vagina, with the cervix uteri seen through the artificial window; – c, c, ureters; – d, d, uterine arteries and accompanying veins. (Modified from Testut.)

more rapidly, and there is no less shock or loss of blood, though claims to the contrary are sometimes made. Vaginal hysterectomy is useful in some types of operation for procidentia." – William P. Graves.

"A vaginal hysterectomy was performed relatively more frequently in years past, when the danger of opening the abdomen was greater and was undertaken with more fear. Formerly the danger of a hernia through the abdominal wall was an additional reason for doing a vaginal hysterectomy when it could be conveniently performed. At the present time most operators prefer to do a hysterectomy through the abdomen rather than through the vagina, even when the uterus is not materially increased in size. If the hysterectomy is performed through the abdomen, the cervix can be left, and any shortening of the vagina avoided. If the hysterectomy is done through the vagina, the cervix is ordinarily removed, and this will produce some shortening and a certain rigidity of the upper end of the vagina. There are, however,

certain indications for performing a vaginal hysterectomy for fibroma of the uterus. If the patient is a large, fat woman, then an abdominal hysterectomy is much more difficult than in a thin woman, and in such a patient, assuming that the vagina is large, the vaginal hysterectomy should be selected as the preferable operation. There is no question that there are less shock and less general disturbance to the patient in a vaginal hysterectomy than in the ordinary abdominal hysterectomy. Therefore a vaginal hysterectomy is the better operation for a patient who is advanced in years, or who is in bad condition for any cause, assuming that the vagina is of reasonable size." – Howard C. Taylor, in speaking of the applicability of vaginal hysterectomy in cases of fibroma of the uterus. In writing of carcinoma of the uterus he states: "Simple vaginal hysterectomy is indicated in the woman of advanced years, with a wide vagina, and in one who, on account of her general condition, is a bad surgical risk. The operation is done less frequently now than in previous years, but is still indicated in certain cases."

"Vaginal hysterectomy is the operation of choice for: – (**1**) The removal of apparently normal uteri, where hysterectomy is judged advisable. This dictum needs no argument to sustain it. The average patient is more quickly and better cured by the vaginal than by the abdominal method; the operation is safer, and the mental shock less severe. These cases are not often met with in the practice of conscientious Surgeons. Almost all of them may be classed as follows: – (*a*) Neurasthenic and insane women in whom it is desired to arrest menstruation permanently for an ulterior effect; – (*b*) Patients suffering from irremediable, severe dysmenorrhea, or recurrent hemorrhages, discharges, and pelvic pain, which have resisted all other forms of treatment; – (*c*) As a part of a compound operation for procidentia. (**2**) Carcinoma of the uterus: – (*a*) When the patient is old and obese, and the disease slow in progress and not far advanced; – (*b*) When the disease is advanced and incurable, as a palliative measure to lessen hemorrhage and discharge; – (*c*) When by reason of weakness or some complication it is considered that the patient cannot bear a radical abdominal operation; – (*d*) When the malignant process is limited to the body of the uterus, and the latter is situated low down in the pelvis and is small enough to be removed through the vagina without segmentation; as in certain cases of deciduoma malignum, carcinoma and sarcoma of the fundus, etc." – Fernand Henrotin – who, continuing, adds: – "The advisability of ever performing vaginal hysterectomy for cancer seems constantly to be questioned in these latter days, since the elaborate and complicated modern pelvic evisceration has come in vogue, but gradually Surgeons are beginning to realize that, after all, only very robust women, in whom the disease has not made much headway, can withstand these formidable dissections. Therefore many of us, some from mature reflection and others by reason of sad experience, reserve the complete radical abdominal operation for very favorable early cases, and perform either vaginal or abdominal hysterectomy in a less radical but also less dangerous manner."

The chief indications for the removal of the uterus, whether by abdominal or vaginal route, are the following: – fibromyoma and adenomyoma – carcinoma and sarcoma – uterine sepsis – prolapse (in conjunction with other surgical steps – v. p. 430) – as part of the removal of uterus, ovaries, and tubes.

In operating by the vaginal route the uterus is usually delivered through an anterior colpoperitoneotomy incision – or, in special cases, such as backward displacement, through a posterior colpoperitoneotomy.

Several different technics are in vogue for the vaginal excision of the uterus – come of the more generally employed, together with their more especial indisations, will be next given.

TOTAL VAGINAL HYSTERECTOMY, WITH THE INTACT UTERUS IN ITS NORMAL AXIS

Description.—The uterus is delivered through the vagina, cervix first, without reversing its axis, and without splitting the organ. This method may be regarded as the most anatomic and surgical of the various methods of removing the uterus by the vaginal route.

As to the general features of vaginal hysterectomy, see p. 459.

The technic of the operation here described and some of the illustrations are modified, in part, from Kelly.

Preparation.—Pubis, labia, and perineum shaved. Vagina cleansed. Bowels and bladder emptied.

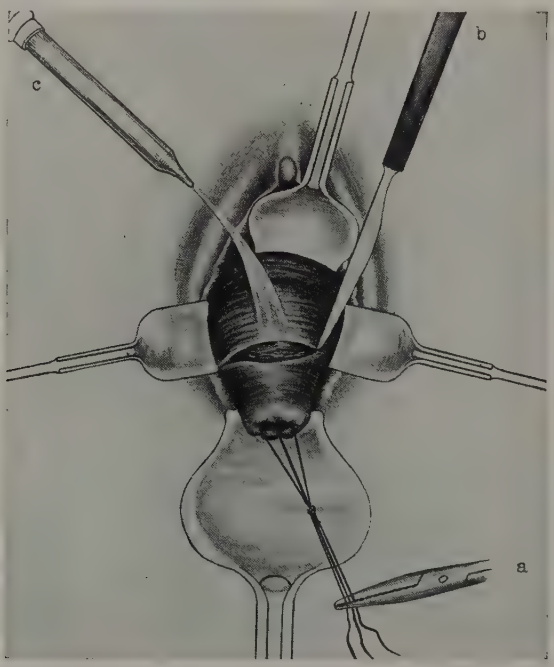


Fig. 5817.—Total Vaginal Hysterectomy with the Intact Uterus in Its Normal Axis—1: a, Sutures closing the lips of the cervix and serving as tractors, by which the uterus is drawn out of the vagina; b, making circular incision through the mucous membrane of the cervix just below the vaginal vault; c, irrigant, washing away blood during the early stages of the operation (until the peritoneal cavity is opened)—a method usually replaced by gauze sponging. The vaginal walls are well retracted.

Position.—Patient supine, at end of table, in lithotomy position. Surgeon sitting at foot of table. Assistant to Surgeon's right, retracting posterior vaginal wall with large Sims, or other retractor—while the lateral vaginal walls are retracted by lateral vaginal retractors.

Landmarks.—Anterior and posterior vaginal fornices; known position of ureters and uterine vessels.

Operation.—The lips of the cervix are caught and drawn down with vulsella or tenaculum forceps—and are sutured together with strong silk (to prevent escape of contents). The silk ligatures may be left as long traction loops. The uterus is thus drawn well down into the outlet (by forceps or loops)—while the vaginal walls are retracted downward and outward, as described above (Fig. 5817). With a knife or sharp curved scissors an incision

is made entirely around the cervix, passing through the thickness of the vaginal vault, down upon the substance of the cervix. With the right index-finger the cellular tissue plane is opened up in front (between uterus and bladder) and behind (between uterus and Douglas' culdesac) – by pushing up and peeling back the tissues with the pulp of the finger always directed against the cervix, to prevent the fingers from slipping off violently in the wrong direction (Fig. 5818). This separation is done anteriorly and posteriorly – but not done laterally, where the vessels enter from the broad ligament. Posteriorly, Douglas' culdesac is recognized by a slight amount of fluid present within its cup-like cavity and by the smooth surfaces gliding over each

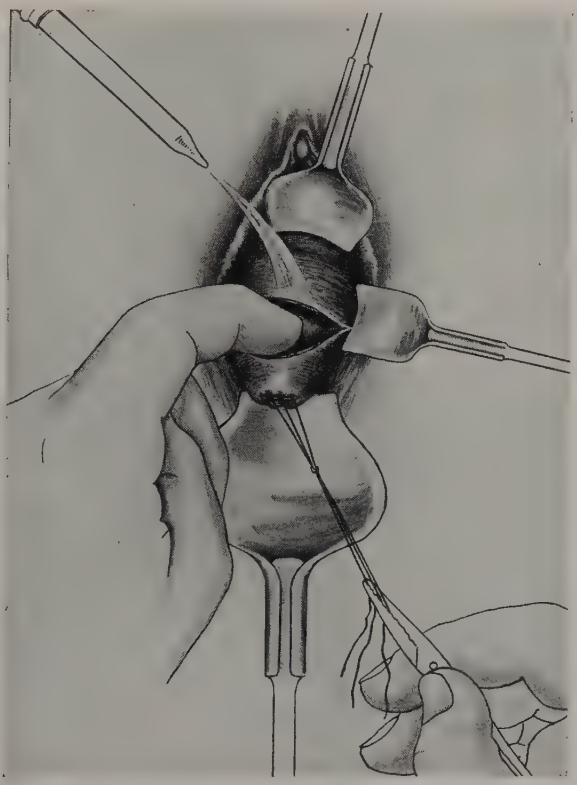


Fig. 5818.—The Same – II; – Index-finger opening up the cellular tissue plane between the uterus and bladder anteriorly – and between the uterus and rectum (Douglas' culdesac) posteriorly.

other. This is caught with forceps, drawn down, and incised with scissors to a slight extent (Fig. 5819), the opening being increased to the broad ligaments on each side by two fingers introduced and separated. Anteriorly, the separation is continued until the anterior vesico-uterine peritoneal fold is reached – which is recognized by its gliding surfaces – and which is drawn down with forceps and also incised with scissors to a limited extent (Fig. 5820) – the opening being increased to the broad ligament on each side by fingers introduced and separated, guided, if necessary, by a sound in the bladder. The peritoneal cavity is thus opened in front and behind and the uterus is left hanging from the broad ligaments.

The broad ligaments are now tied off in segments (Figs. 5821 and 5822). The uterus is drawn well down and to the side opposite that upon which the ligature is to be passed, while the corresponding vaginal wall is retracted. The left index-finger is passed in through the posterior opening behind the broad ligament and near the cervix. A strong ligature, carried by a laterally curved aneurysm needle, is passed from before backward, and from above downward, and about 1 cm. ($\frac{3}{8}$ inch) to the outer side of the cervix, and including about 1 cm. ($\frac{3}{8}$ inch) of broad ligament tissue. The ligature is firmly tied and the broad ligament included is immediately divided with scissors, rather nearer the uterus – being careful not to make the division higher than

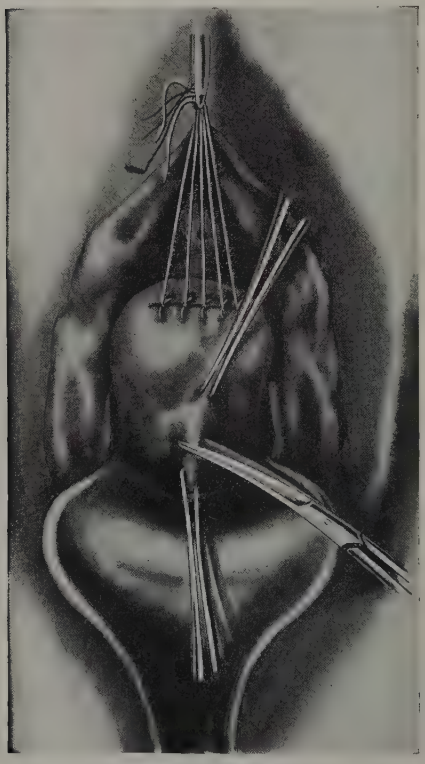


Fig. 5819.—The Same – III; – Incising the recto-uterine peritoneal pouch.

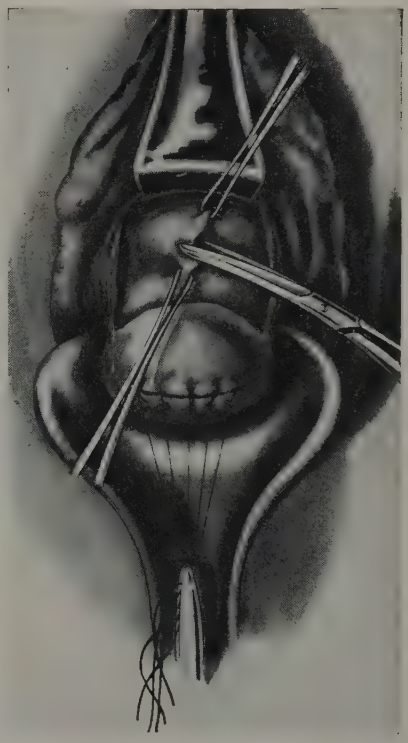


Fig. 5820.—The Same – IV; – Incising the vesico-uterine peritoneal pouch.

the ligature has gone (Fig. 5823). Two or three ligatures can generally be applied to one side before placing the same number on the opposite side, during downward traction of the uterus to the side where the first ligating was done (always drawing it to the side opposite the one upon which the greatest exposure is wished). Or the ligating may be continued up one side as far as convenient, even to the cornu of the uterus, and then upon the other side. The uterine vessels are generally included in the second or third ligature, being found close to the cervix uteri near the os internum. The position of the uterine artery should be determined just before or as soon as the opening through the posterior fornix is made (Fig. 5824). Especial care is here taken to avoid the ureter (see Index and pp. 522–525).

Fig. 5821.—The Same – V: – a, Retractor of anterior vaginal wall and bladder; – e, c, ligating the lower aspects of the broad ligaments in segments; – d, cutting the ligated portions of the broad ligaments from the wall of the cervico-uterine junction; – b, freed portion of right broad ligament.

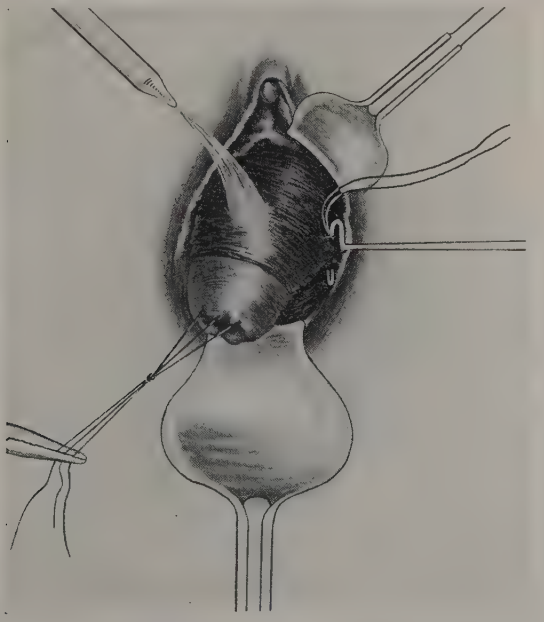


Fig. 5822.—The Same – VI; – The uterus has been drawn further down, *pari passu* with the ligation and division of higher segments of the broad ligaments.

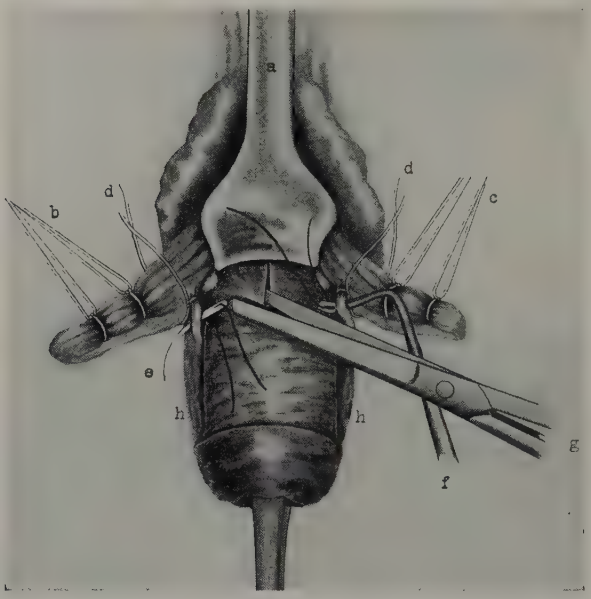


Fig. 5823.—The Same – VII; – The freeing of the uterus has been continued higher: – **a,** Retractor of the anterior vaginal wall and bladder; – **b, d, c,** freed portions of the broad ligaments ligated and divided (shown somewhat in excess); – **h, h,** lateral aspects of cervix and body from which lateral attachments have been severed (represented extending somewhat too low); – **e, f,** ligating the uterine arteries in the lower aspects of the broad ligaments; – **g,** incising the vesico-uterine peritoneal fold (which is sometimes opened at an earlier stage – v. Fig. 5820).

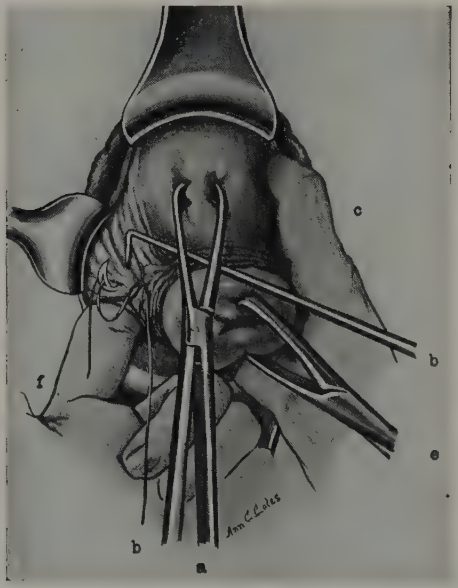


Fig. 5824.—The Same – VIII: – **a,** Forceps and **c,** finger are aiding the cervical vulsellum, **e,** to bring the uterus lower into the vaginal outlet – while the finger of the opposite hand, **f,** passed under and behind the right broad ligament, is serving to guide the passage of the aneurysm needle, **b, b,** in ligating the successive segments of the broad ligaments. (It is not intended, here, that forceps, **a,** should show an attempted reversal of the uterine axis, as might appear.)

When the ligating and division have progressed nearly to the cornu of that side, the finger can be passed in behind and hooked over the remaining broad ligament, fallopian tube, and round ligament, and these brought down and ligated _ this last ligature being tied particularly well and the tissues cut at a distance. Often it is easier to alternate _ by tying two or three ligatures on one side _ then on the opposite, and so on. When all of one side and nearly all of the opposite broad ligament has been tied, the finger may be introduced and hooked around the fundus of the uterus and the organ delivered sidewise _ the remaining ligatures being applied either from below upward or from above downward, as most convenient, while the organ lies in the vulval fissure (Fig. 5825). (Or, after progressing a part of the way, the fundus may be brought down, carrying the cervix up into the pelvic cavity

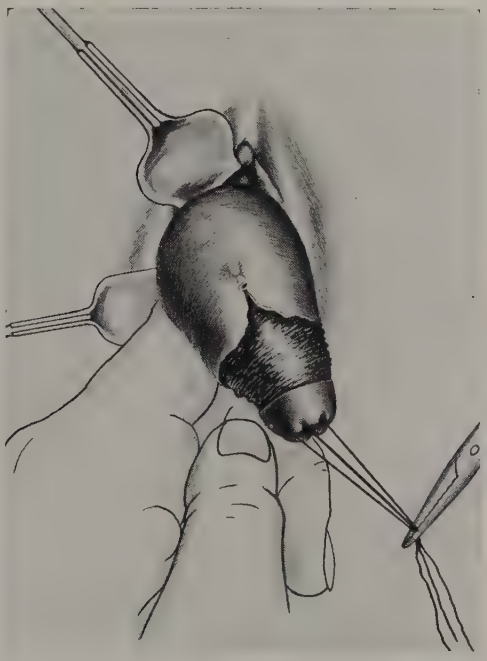


Fig. 5825.—The Same _ IX; _ Delivery of the fundus of the uterus by means of a finger introduced from behind and below _ aided by downward traction of the cervix. The right broad ligament has now been entirely ligated and cut.

and doubling the broad ligament upon itself _ and thus applying the remaining ligatures in the reverse direction. But it is better, and more surgical, to deliver the uterus in its normal axis _ continuing the ligating and division upon the two sides as first described.)

The right and left groups of sutures are now separated and held aside and the lower pelvic cavity mopped or sponged out. Each line of broad ligament ligatures must be inspected _ suspicious ones replaced _ and additional ones applied where indicated. The ligatures of each side are cut near the knot. The cut edge of the vesico-uterine peritoneal fold in front is sutured at its middle with gut to the middle of the cut edge of the uterorectal peritoneal fold behind _ either by a single mattress-suture bringing the central portions of the two peritoneal folds together, or by a continuous suture bringing together the central portion _ leaving, in either case, a gap at either side for possible drain-

age in cases where the vaginal vault is not sutured, or only sutured in part. Where the vaginal vault is entirely sutured (Fig. 5826), the two edges of the peritoneum should be first sutured together throughout.

The vaginal vault may be left entirely unsutured – or be partly sutured – in which cases it is packed loosely with gauze (Fig. 5827), and the vagina is then packed rather snugly. In other cases, and this method is to be preferred, the vaginal vault is entirely closed by a line of continuous or interrupted gut sutures bringing the cut edges of the fornices together and crossing the dome of the vagina from before backward. If drainage be indicated, the

Fig. 5826.—The Same – X; – Complete closure of the vaginal vault. The margins of the peritoneum have been sutured – and the margins of the vaginal wall are being closed.

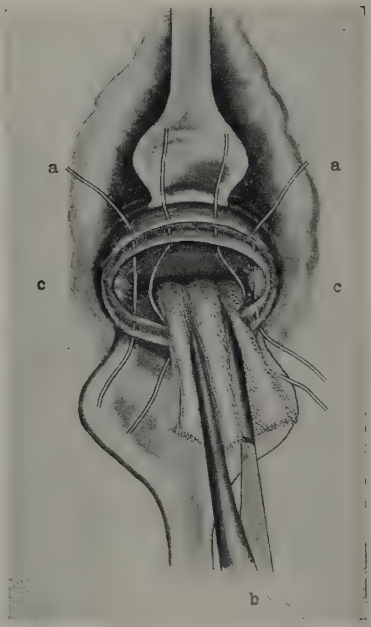


Fig. 5827.—The Same – XI; – Closure of the vaginal vault with temporary gauze drainage: **c, c,** The stumps of the broad ligaments have been anchored within the margins of the vaginal opening on each side; – **b,** a strip of gauze is being carried, loosely, into the peritoneal cavity; – **a, a,** sutures uniting the margins of the anterior vaginal wall and incised vesico-uterine peritoneum, on the one hand – and the margins of the posterior vaginal wall and recto-uterine peritoneum, on the other, as a single tier of sutures – with but light tying opposite the exit of the temporary drain.

lower portion of the ligated broad ligament is caught and drawn down into the upper part of the vagina, at each side, and the sutures which pass through the lips of the vaginal vault also pass through and include some of the broad ligament stump – the stumps on the two sides thus projecting into the vagina, thus insuring drainage (Fig. 5828).

Comment.—Up to the opening of the peritoneal cavity blood may be removed by constant irrigation through a special glass tube held just above the vulva – after opening the peritoneum, by gauze mops.

Catheters passed into the ureters before the operation enable the position of the ureters to be readily made out and guarded during operation.

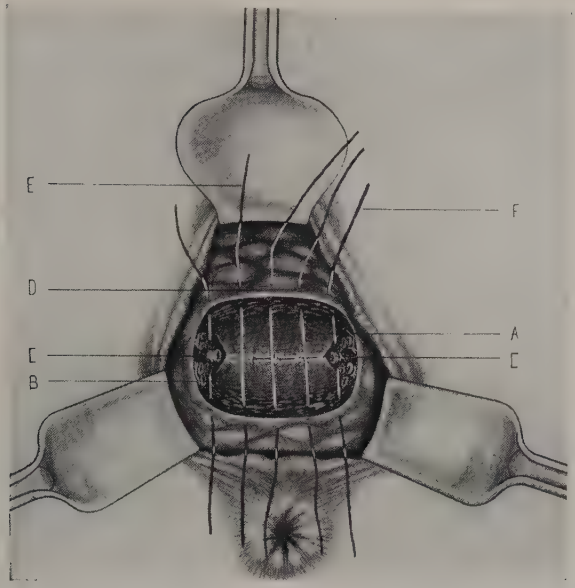


Fig. 5828.—The Same – XII; – Closing the vaginal outlet by a double tier of sutures – of peritoneum and vaginal wall – peritoneal and vaginal suturing: – A, Vesico-uterine peritoneal fold; – B, uterorectal peritoneal fold. A transverse line of interrupted sutures unites the central portion of these folds; – C, C, vessels and broad ligament ligated; – D, vault of vagina; – E, sutures approximating cut edges of anterior and posterior vaginal fornix, thus repairing dome of vagina; – F, each lateral vaginal suture also passes through broad ligament stump, and thus brings it into lip of vaginal wound.

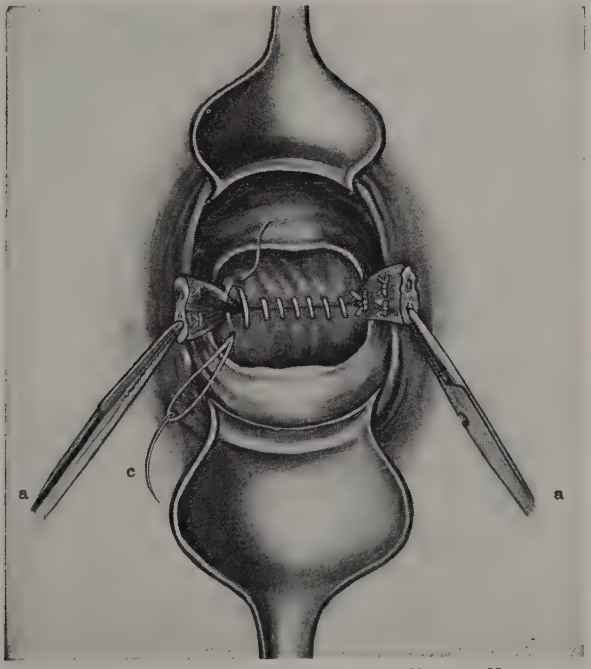


Fig. 5829.—Reinforcing the Vaginal Outlet Following Vaginal Hysterectomy – Bovee – I; – The margins of peritoneum have been sutured together except at their lateral aspects – and through the spaces thus left open the ligated and divided stumps of the broad ligaments, a, b, are being brought – and anchored, proximally, into the corners of the wounds, c.

If it be found, during operation, that it is desirable to remove the tubes and ovaries, ligatures are placed on the outer side of these. These ligatures are somewhat more difficult to apply and tighten than the others.

Especially guard the ureters near the cervix and behind the uterine arteries while working near the cervix.

A variety of methods of closing the vaginal vault are employed _ in the direction of reinforcing the floor of the pelvic outlet. Bovee's method is to first suture together the opposite aspects of the incised vesico-uterine and recto-uterine peritoneal reflections except at their extreme lateral aspects

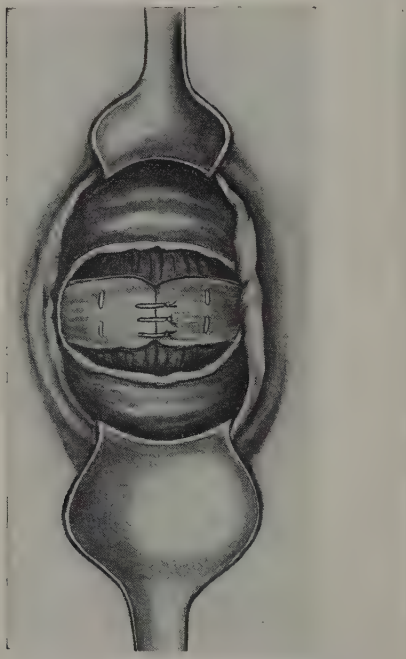


Fig. 5830.—The Same _ II; _ The free ends of the ligated and divided broad ligaments are united, end to end, over the sutured peritoneum. Vessels are ligated in these segments of the broad ligaments _ and are seen in the preceding illustration.

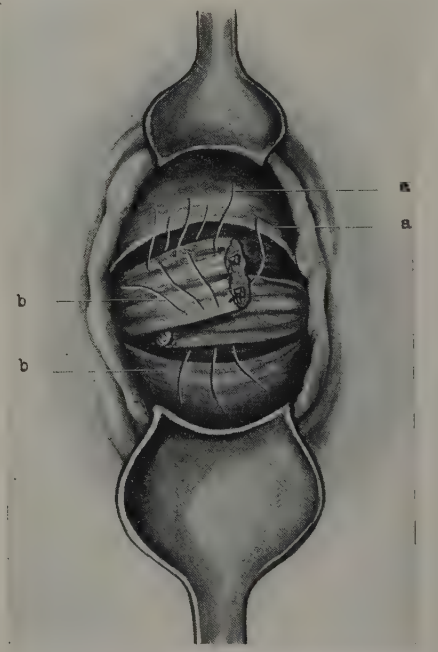


Fig. 5831.—The Same; _ An alternative method of reinforcement is here shown. The ends of the broad ligaments are being overlapped, over the sutured peritoneum, and united to each other by several sutures. Finally, the margins of the vaginal wall will be sutured over these structures _ in both this and in the preceding alternative method.

(Fig. 5829) _ and then bring through these lateral openings the ligatured ends of the broad ilgaments _ anchoring them to the peritoneum and then suturing them together, end to end (Fig. 5830) _ or bringing them far enough together to suture them in an overlapped position (Fig. 5831).

It is probably well to make an application of tincture of iodin to the cervico-uterine canal in advance _ in the event of squeezing fluid from the organ during operation.

Care should be exercised in carefully freeing the bladder and retracting it upward _ which act also has the tendency to additionally carry the ureters upward, further out of the way.

Sponging, rather than the use of a stream of irrigant, is very much more commonly used to control the bleeding of the early stages.

Hug the cervix in opening the recto-uterine peritoneal pouch to protect the rectum.

The uterine arteries are usually tied with silk.

Even though the operation have been undertaken with the intention of not bringing the fundus forward until reached while delivering the organ in its normal axis, yet if it be distinctly advantageous to deliver the uterus during the progress of the operation, this, of course, should be done.

The chief source of hemorrhage is from the uterine and ovarian vessels.

When the ovary and tube, of one or both sides, are to be included in the excision, they are displaced mediad, so that the highest ligature, through the broad ligament, may pass to their outer side.

Sometimes all the ligatures of each side are tied together in one knot, and brought out through the vaginal wound _ to be allowed to come away about the tenth or twelfth day _ silk then generally being employed for all the ligatures.

In the closure of the vault of the vagina, without drainage, the sutures sometimes take in the margin of the anterior vaginal wall, and margin of the vesico-uterine peritoneum, on the one hand _ and the margin of the recto-uterine peritoneum and the margin of the posterior vaginal wall, on the other _ and may also do so when drainage is used.

It is well to include the cut ends of the round ligaments in the anchorage of the broad ligament stumps upon the two sides _ as they aid in preventing the tendency of the vaginal wall to prolapse.

TOTAL VAGINAL HYSTERECTOMY OF THE INTACT UTERUS IN ITS REVERSED AXIS

Description.—In this method of operating, instead of proceeding with the delivery of the uterus in its usual axis, cervix first, as just described, the fundus of the organ is brought forward through the colpoperitoneotomy opening _ the cervix slipping back into the vagina _ after which the operation is completed by ligating and dividing the lateral structures which bind the uterus, from the fundus toward the cervix. The operation may have been planned along these lines from the first _ or, upon some warrantable indication, an operation begun along the lines of delivery in the normal axis, as last described, may be converted into and ended as one of reversed axis. Some Surgeons adopt the reversion of the axis as their usual method of procedure. The fundus is usually reversed through an anterior colpoperitoneotomy incision _ but may be brought out of a posterior colpoperitoneotomy opening, especially in the presence of retroversion or other complications.

Preparation _ Position _ Landmarks.—As in the operation last described.

Operation.—The first steps are those of an ordinary transverse anterior colpoperitoneotomy along the usual lines of that procedure (v. p. 372). The anterior vaginal wall and the lower border of the bladder are freed, in the connective plane, from the cervico-uterine junction and retracted upward _ after which the vesico-uterine peritoneal pouch is incised (Fig. 5832). Up to this stage the cervix has been drawn well downward. The hold upon the cervix is now released, and the cervix pushed well backward into the vagina _ the act tending to antevert the fundus. A finger is then introduced into the peritoneal cavity, through the opening in the anterior fornix, and an examination made of the surroundings. Guided by the finger still within the cavity, a vulsellum forceps is made to grasp the anterior aspect of the fundus (carefully avoiding coils of intestine) _ and the fundus brought out through the vaginal opening, aided by an index-finger partly within the cavity.

The ligation and division of the structures of the broad ligament, on each side, close to the uterus, is now systematically carried out (Fig. 5833). These ligatures had best be double, with division between the ligatures – or the uterine aspect may be simply clamped, and the division be made between ligatures and clamps. Some Surgeons use silk for the more important ligatures and chromic catgut for the others – or the latter may be used throughout. In the upper portion of the broad ligament from above downward and from before backward, are tied the round ligament, fallopian tube, and the ovarian ligament

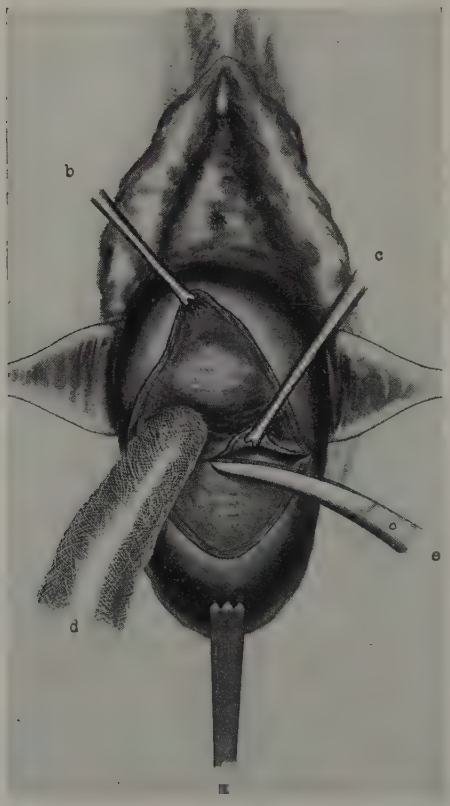


Fig. 5832.—Total Vaginal Hysterectomy of the Intact Uterus in Its Reversed Axis – I; – Opening the anterior vaginal fornix by anterior colpoperitoneotomy: – a, Tractor of cervix; – b, tractor of lip of anterior vaginal incision; – d, blunt dissection of anterior vaginal flap and bladder from anterior wall of cervix; – e, incising the vesico-uterine peritoneal pouch. (Figs. 5832, 5834, 5836, 5837, and 5839 modified from Kroenig.)

(Fig. 5834). These structures are tied and divided, first on one side and then on the other – the uterus being displaced toward the side opposite to the one upon which the work is being done. A somewhat different method of procedure (not so hemostatic in nature) is to ligate the structures of the broad ligaments in segments, from fundus to cervix, somewhat near the uterus, by single ligatures, and then cut the broad ligament structures off from the uterus, closely hugging the latter, from fundus toward cervix (Fig. 5835). The parametrium is thus ligated and divided, by either method, from fundus to cervix – being especially careful that the chief vessels, uterine and ovarian, on each

Fig. 5833.—The Same – II; – The broad ligament of the reversed uterus has been doubly clamped – and is being divided between the clamps – and the proximal border of the divided broad ligament will be ligated in segments.

Fig. 5834.—The Same – III; – The fundus has been brought forward through the vaginal opening, with its axis reversed, the cervix passing backward into the vagina: – a, Vulsellum grasping fundus; – b, finger passed beneath the anterior aspect of the right broad ligament (in its reversed position); – c, c, round ligament, tied at uterine end, and clamped (until tied) at distal end of division; – d, d, fallopian tube tied and divided; – e, proximal one of two ligatures to be tied upon ovarian ligament.

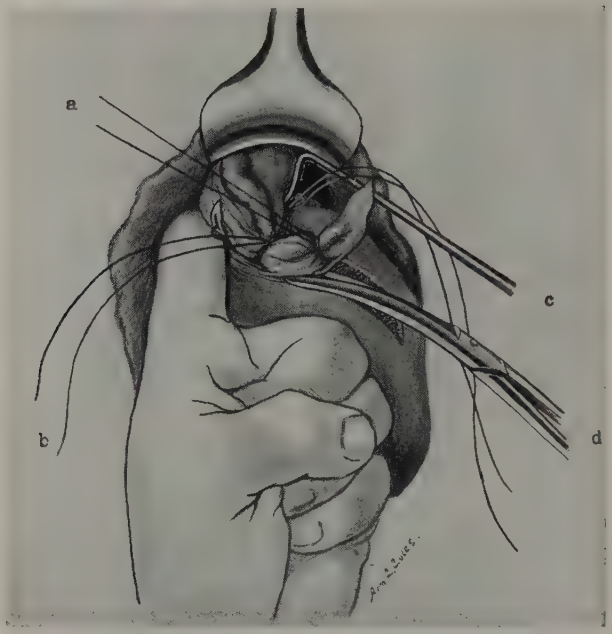


Fig. 5835.—The Same – IV; – An alternative method of ligating the broad ligament by single ligatures and then dividing the ligament close to the uterus: – a, b, c, three upper ligatures; – d, scissors cutting structures from uterus as tied.

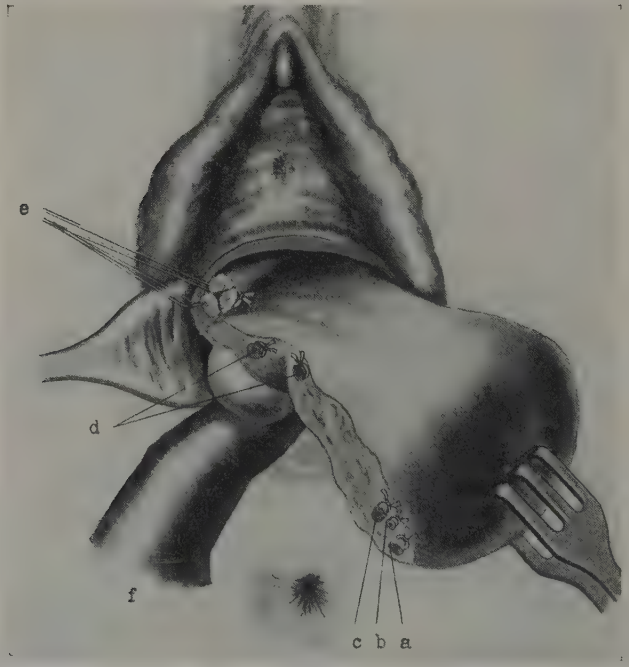


Fig. 5836.—The Same – V; – Broad ligament has been tied and divided down one side of uterus: – a, b, c, Ovarian artery and veins; – d, uterine artery and vein: – e, ligated stumps of right broad ligament; – f, finger, behind cervix, freeing way for section of posterior vaginal wall.

side are safely controlled (Fig. 5836). As the structures of the broad ligaments are divided, their pelvic aspects tend to retract into the cavity, but are kept under control by clamps upon the temporarily-left-long ends of their ligatures (Fig. 5836, e).

Finally, the uterus is freed from its broad ligament attachments on both sides _ retaining only its connection with the posterior vaginal wall _ which is then transversely severed, thus entirely freeing the body and cervix of the uterus (Fig. 5837).

The treatment of the vaginal vault completes the operation. Irrespectively of the other details of closure, the stumps of the broad ligaments (Fig. 5838) are anchored on each side of the vaginal wound, just within (upon the peri-

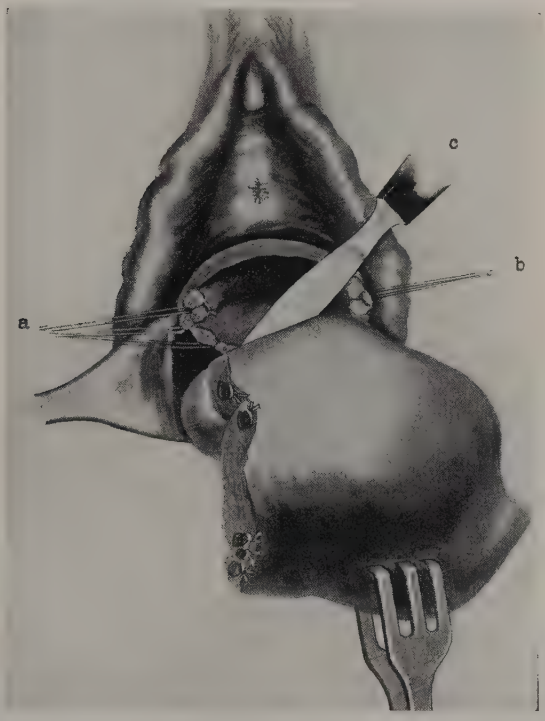


Fig. 5837.—The Same _ VI; _ Dividing the posterior vaginal wall: _ a, b, Stumps of ligated and retracted broad ligaments; _ c, knife section of posterior vaginal wall.

toneal aspect) of its outlet (Fig. 5839). If drainage be indicated for a day or two, this is usually provided for by leaving a strip of gauze between two or more temporarily-left-untied sutures. The actual closure of the vaginal vault may be accomplished in one of two ways _ in common to most of these operations. Either the margins of cut peritoneum and cut vaginal walls may be first approximated to each other _ and then the anterior lip of this combined union be sutured to the posterior lip of the combined union, bringing serosa to serosa for union (v. Fig. 5839). Or (and a better plan in the mind of the Author) each interrupted suture may pass, in order, through anterior vaginal wall, anterior margin of peritoneum _ and, crossing the gap _ come out through posterior margin of peritoneum and posterior vaginal wall (Fig. 5840).

Fig. 5838.—The Same – VII; – The appearance of the broad ligament stumps after the removal of the uterus.

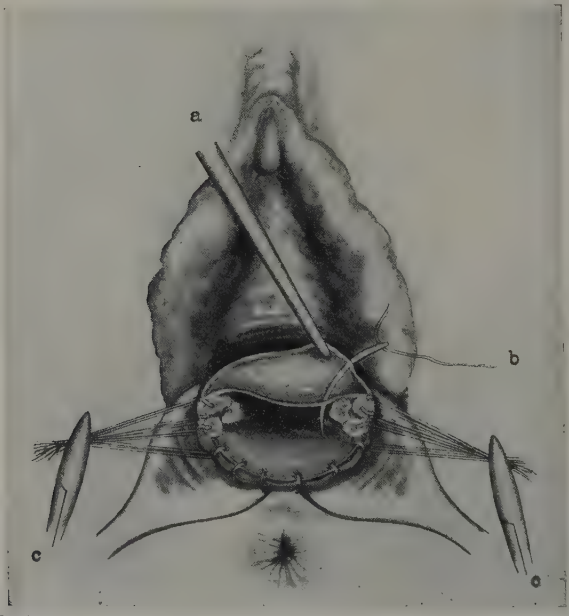


Fig. 5839.—The Same – VIII; – Closing the vaginal vault: – c, c, Stumps of ligated and divided broad ligaments being anchored just within the vaginal opening; – a, upper margin of anterior vaginal wall being held, while suture is uniting it to the lower margin of anterior peritoneum vaginal wall – reinforcing the vesico-uterine reflection. The bulging wall of the bladder between these margins is to be noticed – and guarded. Finally, sutures will be placed uniting upper margins of the posterior vaginal wall, in front, to the lower margins of posterior vaginal wall, behind. The cut margins of peritoneum are included in the marginal sutures.

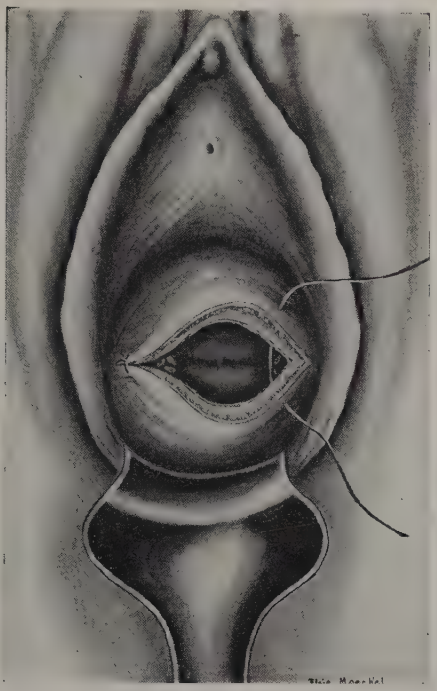


Fig. 5840.—The Same _ 1X; _ The vaginal vault (after anchoring the stumps of the broad ligaments just within the vaginal opening) is being closed by interrupted sutures which unite the margins of the anterior vaginal wall and peritoneum to the margins of the posterior border of peritoneum and posterior vaginal wall.

TOTAL VAGINAL HYSTERECTOMY BY AXIAL HEMISECTION, WITH THE UTERUS IN ITS NORMAL AXIS

Description.—Delivery of the uterus by splitting, or hemisection, has its chief application in cases where the uterus is large and the vagina small _ or where, from other circumstance, some disparity of measurement is present which renders the mechanical steps of the delivery of the intact uterus difficult. The feature in common with the various methods of hemisecting or splitting the uterus in its axis consists in the fact that, for the time being, the portion of tissue being dealt with is reduced one-half in bulk _ which, while temporarily displacing the other half back into the pelvis, or further back into the vagina, affords easier and more complete access to the junction of the broad ligament structures with the uterus, which is the chief site of importance in the technical control against hemorrhage of the parts left behind _ the site most difficult to expose _ and the site in the neighborhood of which the most important structures lie which must be safeguarded.

Preparation _ Position _ Landmarks.—As in Vaginal Hysterectomy, in General (v. p. 462).

Operation.—Two methods of axially splitting and delivering the uterus in its normal axis, from cervix to fundus, are available.

(*a*) In the Simultaneous Splitting of Anterior and Posterior Walls the method usually employed, both the anterior and posterior uterine walls are medially split *pari-passu* _ first the anterior and then the posterior wall being cut in short upward stretches _ as in the Müller-Quénu technic, to be here described. The operation begins by a circular incision carried through the

mucous covering of the cervix into the connective-tissue plane (Fig. 5841, **a, b**). The structures overlying the musculature are then freed upward – the bladder being mobilized and displaced upward with especial care. This process of freeing is sometimes made easier by adding lateral vertical cuts to the cuff of tissue which is being mobilized, chiefly by blunt dissection (Fig. 5842). After this upward freeing has been carried on sufficiently far the anterior and posterior peritoneal pouches are divided transversely – the cervix is split medially – first through its anterior lip (v. Figs. 5842 and 5843) –

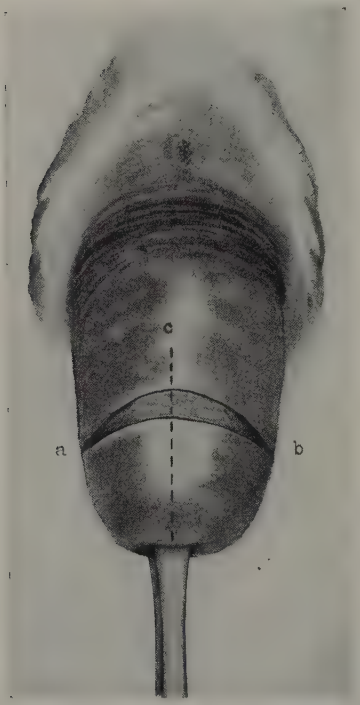


Fig. 5841.—Total Vaginal Hysterectomy by Axial Hemisection with the Uterus in Its Normal Axis – I: – **ab,** Line of circular division of the cervical mucosa; – **c,** anterior median line along which the axial splitting of the anterior cervico-uterine wall will be commenced – corresponding with a similar one posteriorly.

Fig. 5842.—The Same – II; – The cervico-uterine walls are being freed, anteriorly and posteriorly, up to the level of the peritoneal reflections, carefully lifting the bladder, **a,** anteriorly. This freeing is aided by lateral cuts made into the cuff. Scissors, **b,** are dividing the anterior wall – while vulsellum forceps are drawing the uterus downward.

and then through its posterior lip. During this splitting tension is kept up upon the vulsella forceps which are drawing down the two halves – and whose hold upon these halves is shifted to higher positions as more and more of their structure is exposed (Fig. 5843). Finally the bisection is completed – the scissors emerging at the fundus – over which a finger of the opposite hand is placed during the latter part of the cutting, lest the scissors suddenly slip beyond, into the cavity, where coils of intestine might be injured. Just prior to the final division one pair of forceps is shifted to grasp

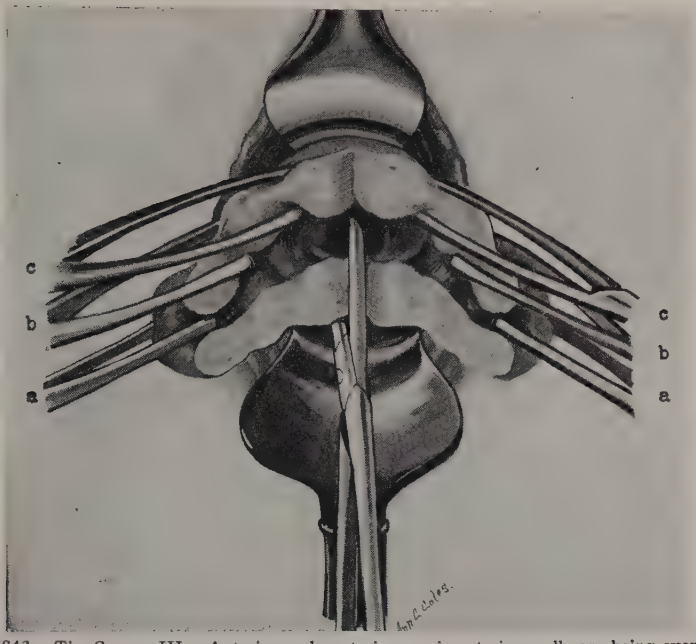


Fig. 5843.—The Same _ III; _ Anterior and posterior cervico-uterine walls are being evenly split in the median line _ while the resulting halves are being drawn downward and outward by clamp forceps, a, b, c, successively grasping the severed margins.

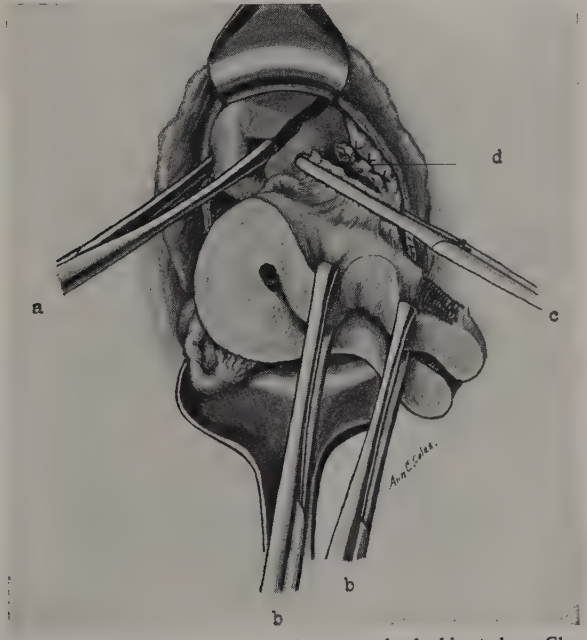


Fig. 5844.—The Same _ IV; _ The uterus has been completely bisected: a, Clamp holding end of split half allowed to temporarily recede, to give more working room; _ b, b, clamps manipulating the opposite half, to expose the broad ligament for segmental ligation; _ c, clamp to uterine side of broad ligament; _ d, segments of the broad ligament already ligated, with division of the structure between these and the clamp.

the lower end of the cervix _ so that when the division is finished, one-half of the uterus may be allowed to draw back into, or be pushed into the vagina, to give additional room for manipulating the one whose broad ligament is being dealt with. If the hemisection have taken place in the anatomically median line of the uterus, remarkably little bleeding is due to occur from the large cut surfaces _ the section then being in the line of minimum vascularization, where the two halves meet.

Each half of the split uterus is now so manipulated, in turn, that the lateral attachment of its broad ligament is conveniently exposed _ the structures of which are then ligated in segments _ either from fundus toward cervix (Fig. 5844) _ or from cervix toward fundus.

Fig. 5845.—Alternative Method of Splitting and Delivering the Uterus in Its Normal Axis; _ In which the anterior half is first medially split from cervix to fundus _ and then the posterior half.

The operation is here concluded, and the vaginal vault closed in exactly the same manner as described and pictured in the preceding operation (v. p. 493).

(*b*) In the Consecutive Splitting of the Walls a somewhat different manner of accomplishing the division is employed, as follows: _ The anterior wall of the uterus is first entirely bisected from cervix to fundus. Two fingers are then carried behind the fundus, and the posterior wall similarly divided in the median line, from below upward (Fig. 5845). The rest of the operation is concluded as just described.

TOTAL VAGINAL HYSTERECTOMY BY VERTICAL HEMISECTION AND VERSION OF THE AXIS OF THE UTERUS

Description.—The uterus is in this procedure either split from cervix upward, through its anterior wall, and delivered, fundus first, through an anterior colpoperitoneotomy incision _ or is split from cervix upward, through its posterior wall, and delivered, fundus first, through a posterior colpoperitoneotomy incision. The vaginal wall may be circularly separated from the cervix early in the operation _ or it may be the last step. This method has been especially employed in uteri enlarged by fibromyomata.

Preparation _ Position _ Landmarks.—As in the preceding methods.

Operation.—The version of the uterus may be accomplished through the anterior or posterior vaginal route _ which must be decided, however, in

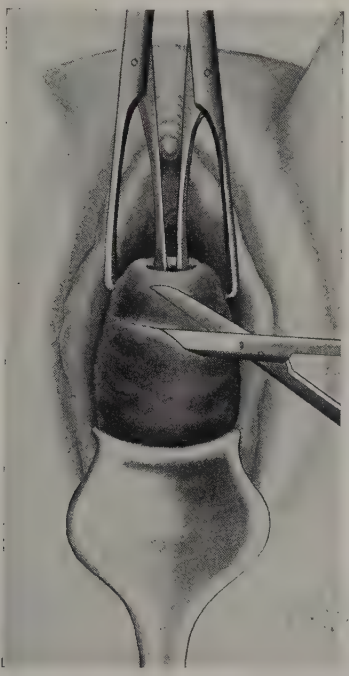


Fig. 5846.—Total Vaginal Hysterectomy by Anterior Vertical Hemisection, with Delivery of the Fundus Through an Anterior Colpoperitoneotomy Incision, and with Early Separation of the Vaginal Wall from the Cervix _ Doyen's Technic _ I; _ Circular division of the cervical mucosa, preparatorily to turning upward a cuff of vaginal wall.

advance, as the fundus of the uterus is turned forward toward that wall of the cervix (anterior or posterior) which has been split.

(*a*) **Total Vaginal Hysterectomy by Anterior Vertical Hemisection, with Delivery of the Fundus Through an Anterior Colpoperitoneotomy Incision, and with Early Separation of the Vaginal Wall from the Cervix** _ Doyen's Technic.—The lateral lips of the cervix are seized with two vulsellum forceps and drawn outward _ while, with knife or scissors, a circular section is made around the cervix (2 cm. or 12/16 inch above the os) into the connective-tissue plane (Fig. 5846). The cuff of tissue thus liberated is freed upward to the vesico-uterine peritoneal reflection in front (carrying the bladder with it) _ and to the recto-uterine reflection behind

(Fig. 5847). The bladder is due to be encountered from 15 to 18 mm. (10/16 – 12/16 inch) above the cervix. The peritoneum is then incised through both the anterior and posterior fornices. When the peritoneal cavity has been opened the question should be definitely decided, by digital examination, as to whether the uterus is deliverable, even when bisected otherwise the procedure must be abandoned. In proportion as the uterus can be depressed will the opening of the anterior and posterior peritoneal pouches be facilitated.

The special technic of Doyen now comes into play – and consists in the manipulation of the vulsellum clamps during the hemisection. With a pair of stout, straight, round-pointed scissors the anterior wall of the cervix is divided exactly in the median line, while the two pairs of forceps which have

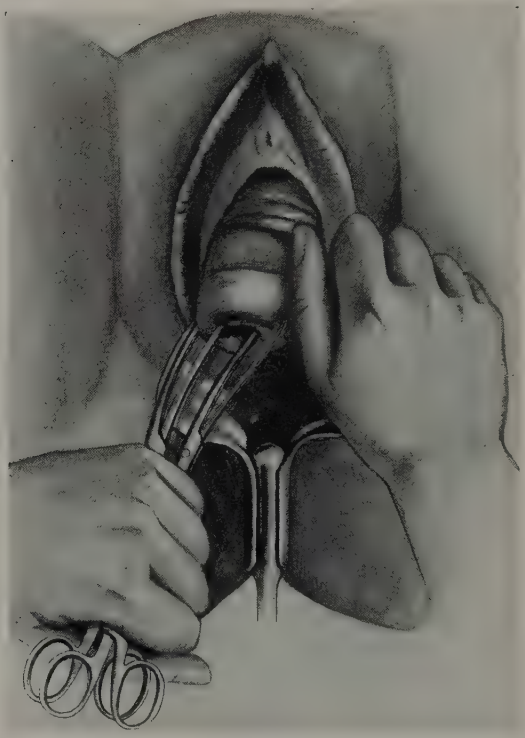


Fig. 5847.—The Same – II; – Upward freeing of the vaginal cuff in the connective-tissue plane – including the lower border of the bladder.

grasped the lateral lips of the cervix draw the parts downward and apart. As soon as this initial section has been carried upward sufficiently far, following the median line closely throughout, a second pair of clamps seize, on each side, an aspect of the divided margin between the hold of the lowermost clamps and the highest extent of the section (Fig. 5848). Traction upon the second set of clamps will bring the body of the uterus down still further – which is then further divided in the median line – and a still higher hold by a third set of clamps taken (the second pair being disengaged—Fig. 5849) – and so on, until the fundus is reached – the preceding pair of clamps being released each time a successive pair seizes a higher hold – until the fundus glides out from the cavity into the vagina, and then outside of the vagina (Fig. 5850)

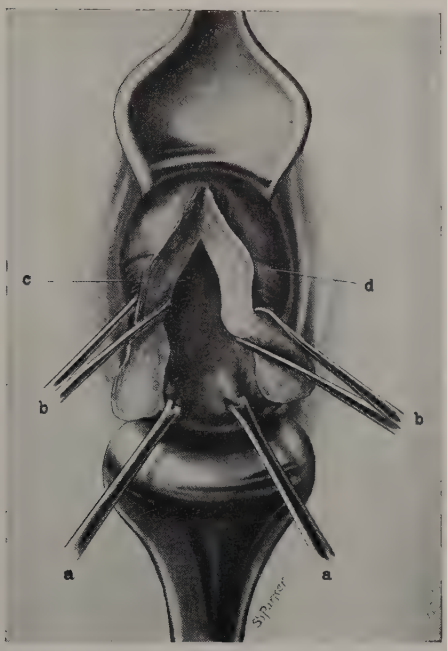


Fig. 5848.—The Same _ III; _ The second median cut of the anterior cervical wall: _ a, a, Clamps of the lateral aspects of the cervical margins; _ b, b, clamps of the next higher stage grasping the divided margins of the uterus; _ c, d, continuing the upward division.

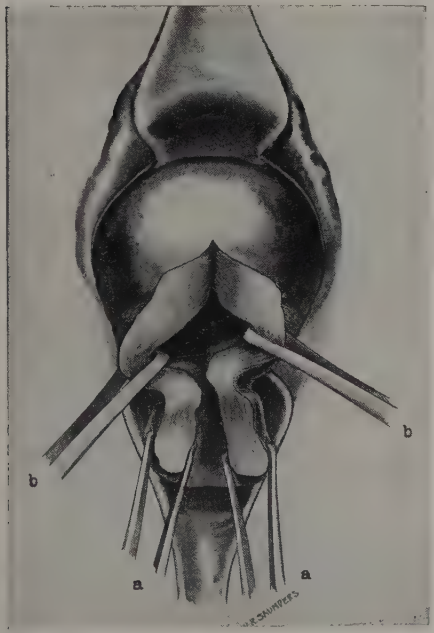


Fig. 5849.—The Same _ IV; _ The next higher cut through the body of the uterus: _ a, a, Cervical clamps; _ b, b, successively higher clamps.

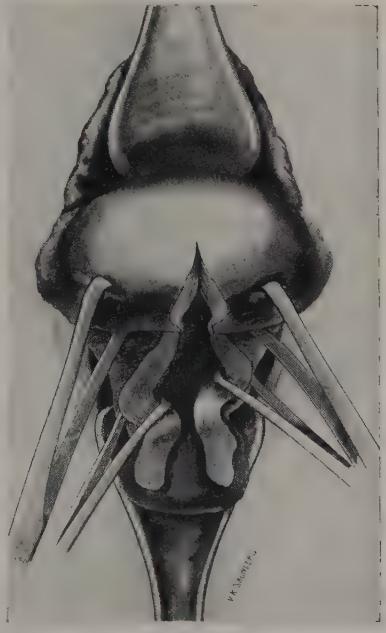


Fig. 5850.—The Same _ V; _ The anterior median section has passed upward into the fundus uteri.

The uterus is now entirely split anteriorly _ but is held by the posterior continuity of its two sides, and by the still attached broad ligaments. Two fingers of the Surgeon's right hand are introduced into the peritoneal cavity, over the fundus, and the fundus, together with the uterine appendages, are delivered forward through the vaginal opening.

The broad ligaments are now to be ligated and divided _ the line of ligation and section lying near the uterus, if the appendages are to be saved, and outside of these, if they are to be included in the excision. Two pairs of clamps are applied to the broad ligament of the side which has been first brought forward for control _ the upper one, applied from above, controlling a little more than the upper half of the broad ligament _ and the lower one,

Fig. 5851.—The Same _ VI; _ Final delivery of the entire uterus; _ the left broad ligament has been clamped from above and from below preparatorily to ligating its structures mediad to the clamps.

applied from below, controlling a little more than the lower half of the ligament _ the tips of the two clamps lying in lateral contact with each other in the middle (Fig. 5851). The ligatures are applied in the usual manner, in segments, and the ligament divided on the medial side. The opposite side of the broad ligament is similarly treated (Fig. 5852). The uterus, with or without its appendages, is thus removed _ following which the safety of the ligatures (which have temporarily been left long) of the structures of the broad ligaments is carefully examined before cutting them.

Where the broad ligaments are controlled by ligatures of chromic catgut, three are usually applied on each side _ the lowest include the uterine vessels _ the highest, the utero-ovarian pedicle _ and the middle, in the center of the

broad ligament, interlocking with the others. These ligatures may sometimes be applied without first clamping the broad ligaments. The broad ligament stumps are then sutured together in the middle line to give support to the pelvic structures.

In other cases, especially where difficulty, chiefly from adhesions, is experienced in delivering the parts, ligatures cannot be satisfactorily applied to the broad ligaments _ and in these instances the clamps upon the broad ligaments are temporarily left *in situ*, the upper clamp folding the upper half of the broad ligament down upon the lower half _ the broad ligament pedicles then being exteriorized in the vaginal wound _ or anchored first within the

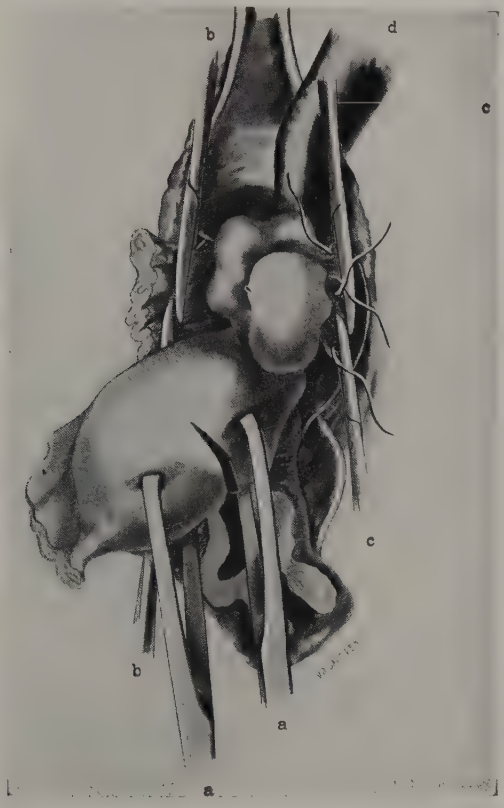


Fig. 5852.—The Same _ VII; _ The right broad ligament has been ligated and divided _ and the left broad ligament has been clamped, and is being ligated, outside of ovary and tube.

peritoneum _ constituting, practically, vaginal hysterectomy by the clamp method (v. p. 491).

Where ligatures have been used, the margins of the vaginal wound, including the adjacent margins of peritoneum, are brought together in the usual manner (see preceding operations) _ temporary drainage being established or not, as may be indicated, by a strip of gauze being carried into the cavity between two temporarily-left-untied sutures.

(*b*) **Total Vaginal Hysterectomy by Posterior Vertical Hemisection, with Delivery of the Fundus Through a Posterior Colpoperitoneotomy Incision, and with Late Separation of the Vaginal Wall from the Cervix** _ Czerny's Technic.—This may be regarded as representing the most radical

type of vaginal hysterectomy. The operation as here described includes as radical a removal of the uterus, appendages, and adjacent structures as possible by this route.

The cervix is seized by a clamp upon each side, one blade pressing the inner, and the other the outer aspect of its wall – and while these draw the uterus downward and outward and put the posterior wall upon both longi-

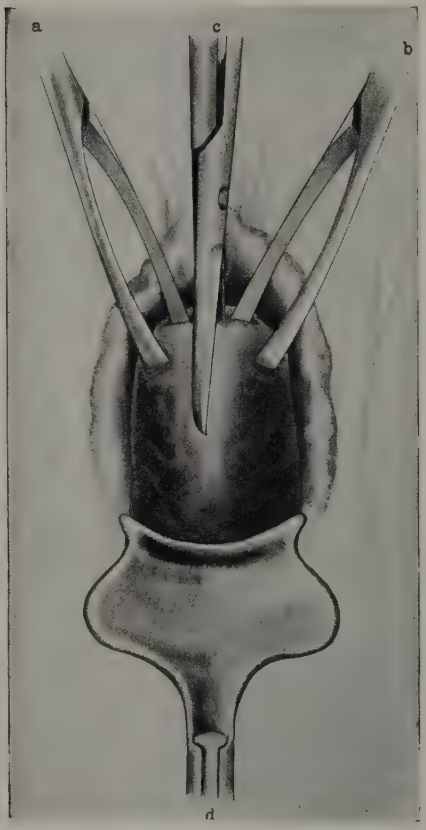


Fig. 5853.—Total Vaginal Hysterectomy by Posterior Vertical Hemisection, with Delivery of the Uterus Through a Posterior Colpoperitoneotomy Incision, and with Late Separation of the Vaginal Wall from the Cervix – Czerny's Technic – I; – Splitting the posterior cervical wall in the median line: – a, b, Laterally applied clamps; – c, heavy, straight scissors making the median section. (Figs. 5853–5860 modified from Döderlein.)

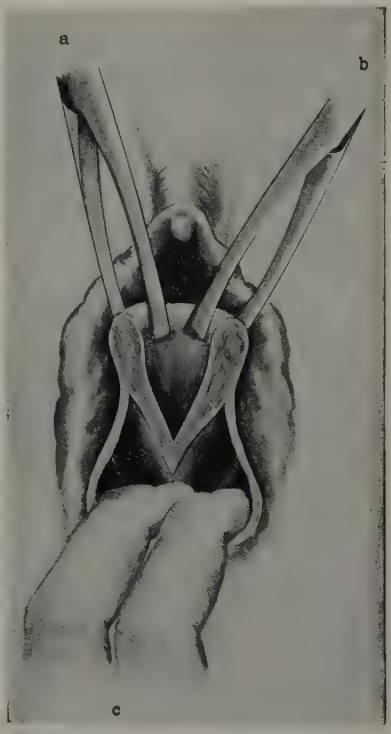


Fig. 5854.—The Same – II; – The posterior median section of the cervicocorporeal junction opens up the recto-uterine peritoneal pouch.

tudinal and transverse tension, the posterior wall of the cervix is divided exactly in the median line by straight, stout scissors, with rounded ends (Fig. 5853). This section is continued on upward toward the body of the uterus until the cut includes and opens up the recto-uterine peritoneal pouch (Fig. 5854). No transverse incision of the fornix is made. At this stage the first and second fingers of the right hand are introduced into the cavity, and the nature of the surroundings determined while pressing the

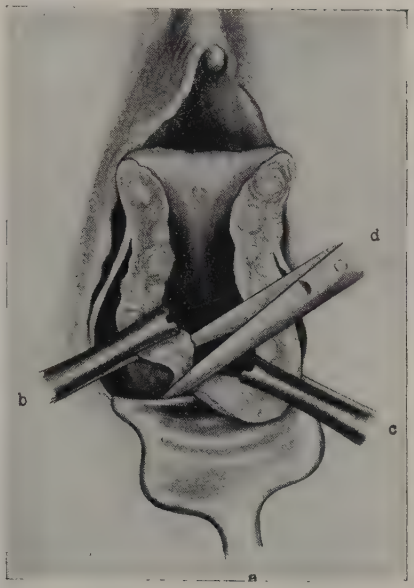


Fig. 5855.—The Same _ III; _ The continuation of the posterior median section of the uterus _ while the vaginoperitoneal wound is held open, **a** _ and tractors, **b** and **c**, draw the divided walls outward as the section progresses. The section is absolutely median, although the scissors, **d**, *appear* to be cutting out of the median line.

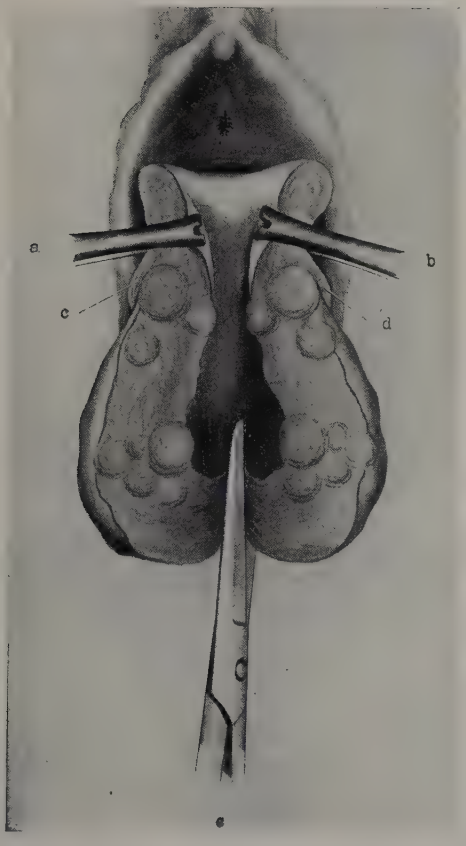


Fig. 5856.—The Same _ IV; _ The posterior wall of the uterus has been entirely bisected. Clamps, **a** and **b**, are holding the split walls apart, while scissors, **e**, are dividing the fundus and the anterior wall (of the reversed uterus) in the middle line; _ **c**, **d**, vaginal wall divided in the initial cut _ the guide-lines of the letters indicating Douglas' culdesac laid open.

abdominal wall downward. If this examination do not show the feasibility of continuing the excision by the vaginal route, the damage thus far done is slight, and the wound is closed.

Continuing the operation, the margins of the split portion of the cervicouterine wall are grasped by clamps, one on each side _ drawn further downward _ and split higher in the median line (Fig. 5855). This progressive downward and outward traction of the posterior wall, together with the median division of each segment thus presented, is continued until the fundus of the uterus is brought forward upon its reversed axis and entirely delivered through the posterior median colpoperitoneotomy incision _ its split posterior surface now looking forward _ and its still intact anterior surface looking

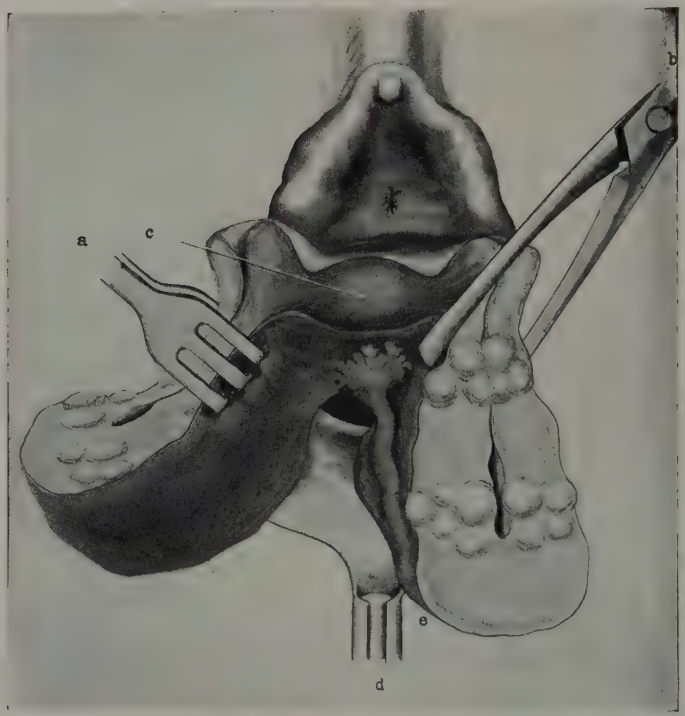


Fig. 5857.—The Same _ V; _ The uterus has been entirely divided except at its vaginal connections in front (apparently behind in this position): _ a, b, Clamps everting the two halves of the uterus; _ c, position of the bladder seen through the connective tissue; _ d, retractor of the vaginoperitoneal opening; _ e, left fallopian tube and ovary.

backward into the vagina (Fig. 5856). The median splitting of the posterior wall is now accomplished, but in this case the section is made from the fundus toward, but not, at first, entirely through the cervix (v. Fig. 5857). This division is carried carefully through the muscular tissue of the anterior wall of the cervix until the connective-tissue plane is reached _ back of which, in this unnatural position of the parts, the anterior vaginal wall lies, here really dorsad (Fig. 5857). The bladder, the ureters, and the structure of the broad ligaments are to be especially guarded at this junction.

A circular section into the connective-tissue plane is now made around the displaced cervix (corresponding with the circular incision made around it in the immediately preceding operation) _ and the cuff of cervicovaginal

mucosa pushed off the halves of the split cervix until the recto-uterine peritoneal reflection can be transversely divided. It is in the final circular section of the vaginocervical wall that the bladder must be especially protected and the ureters along with it — by the upward retraction of the bladder, which draws the uterus upward with it.

The two halves of the uterus are now held by the broad ligaments only. Bleeding which has occurred up to this time, and which, if the section have been exactly in the median line, is not as great as might be expected, is controlled by temporarily applied clamps. The final hemostasis lies in the control

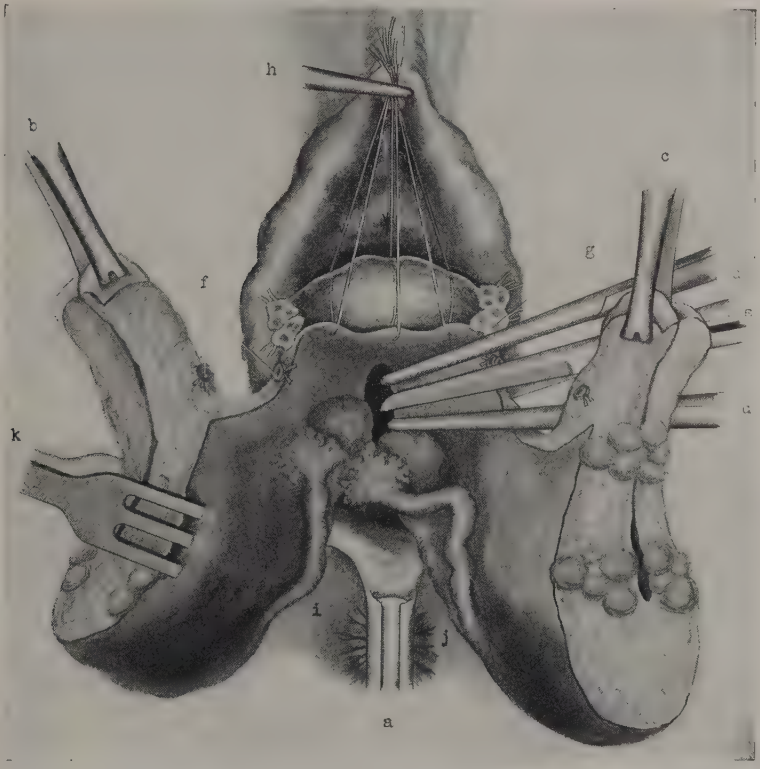


Fig. 5858.—The Same — VI; — The structures of the lower parts of the broad ligaments have been ligated and divided — and the upper parts of the broad ligaments (shown here lowest in the reversed position) hav e been doubly clamped on one side, and are being divided: — **a,** Retractor of vaginoperitoneal opening; — **b, c,** clamps of the cervical halves, which have been freed up past the uterine vessels, which have been tied,**f;** — **d, d,** clamps of the upper part of the left board ligament; — **e,** scissors dividing this part between the clamps; — **g,** stumps of ligated and divided lower portions of the broad ligaments; — **h,** sutures uniting the margins of the vaginal wall and peritoneum over the bladder; — **i, j,** ovaries and fallopian tubes included in the excision; — **k,** vulsellum grasping the right half of the uterus.

of the ovarian and uterine vessels of each side, by the segmental ligation and division of the broad ligament structures (Fig. 5858). These may be tied directly, as is best — or be first clamped, and then tied after the halves have been entirely removed.

The closure of the vaginal vault is accomplished in the manner usually employed in these cases. The broad ligament stumps are either sutured together in the median line, to strengthen the floor of the pelvis — or are anchored just within the lateral aspects of the vaginal opening. The margin of the

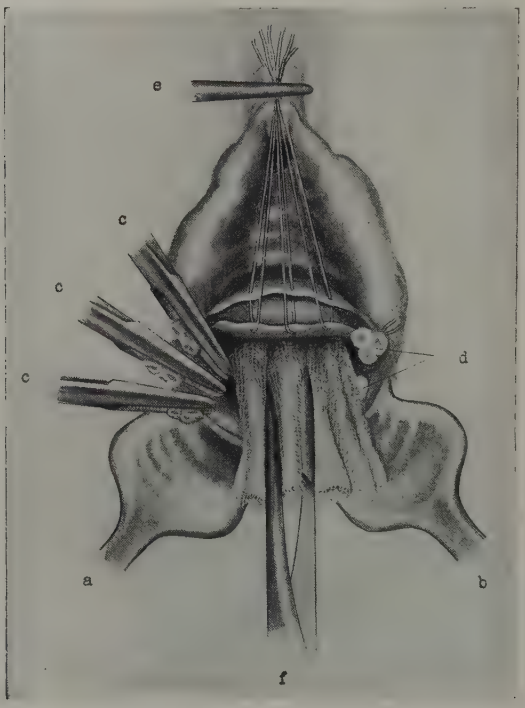


Fig. 5859.—The Same – VII; – Closing the vaginal wound: – **a, b,** Retractors of the vaginal mucocutaneous outlet (only); – **c, c, c,** segments of the right broad ligament clamped, ready for ligation; – **d,** the corresponding left one ligated; – **e,** margins of incised vagina and peritoneum being united over the position of the bladder; – **f,** strip of temporary gauze drain being placed within the peritoneal cavity.

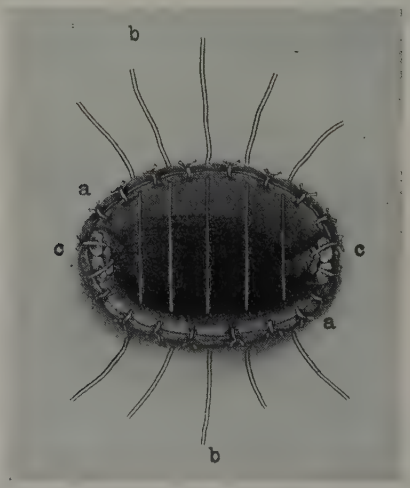


Fig. 5860.—The Same – VIII; – Diagrammatic details of one of the methods of closure of the vagina – after anchoring the broad ligament stumps laterally, **c, c** – and after first uniting the margins of the anterior vaginal wall and peritoneum, and the margins of the posterior vaginal wall and peritoneum, **a, a.** Sutures, **b, b,** unite the peritoneal aspect of the two lips of this opening.

anterior vaginal wall and margin of the anterior peritoneum are sutured together, thus safeguarding the bladder (Fig. 5859) _ and the margin of the posterior vaginal wall and margin of the posterior peritoneum similarly united _ after which the anterior combination of vaginal wall and peritonenum may be sutured to the posterior combination of vaginal wall and peritoneum (Fig. 5860). Or the suturing of these parts may be done as previously described and illustrated. Drainage may be provided for if indicated _ making its exit between sutures left temporarily untied.

TOTAL VAGINAL HYSTERECTOMY BY THE CLAMP METHOD OF CONTROL

Description.—The clamps are here not used simply for the control of the parts until ligatures can be applied, as in the preceding methods _ but

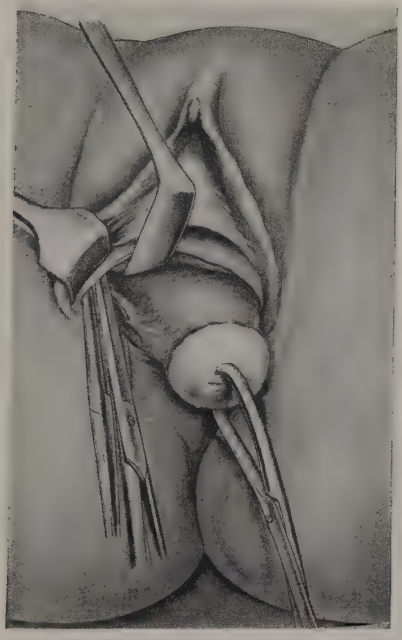


Fig. 5861.—Total Vaginal Hysterectomy by Clamp Control of the Broad Ligaments in Their Normal Axes _ I; _ Freeing the cervix by circular division of the mucosa, with retraction _ the application of the lowermost set of clamps _ and the division of this segment of broad ligament between clamps and uterus.

are applied to the structures of the broad ligaments during the course of the operation for the purpose of controlling hemorrhage, and are, in ending the operation, brought out of the vagina protected in dressings _ and there allowed to remain for forty-eight hours until the vascular lumina are safely obliterated. (No ligatures are applied to the broad ligaments in the distinctive operation _ though sometimes this is done, and the clamps withdrawn.)

This method, while associated with a distinctive technic, may be applied, in emergency, in any of the forms of vaginal hysterectomy _ and is, of course, most apt to be called for in those cases where difficulty of delivery of the uterus occurs, whether because of disparity in size between it and the vagina

are present, or adhesions or other complications are evident _ or where the greater speed of the clamp method is indicated. It is less surgical than the exercise of control by ligature.

The method was formerly practised as a routine _ and now chiefly as an emergency, or as an exceptional procedure. The greatest danger in the operation is the possibility of including one or both ureters.

As far as the technic is concerned, it amounts to the substitution of clamps for ligatures _ and these may be employed in one of two general ways _ the steps of the operation, other than in respect to this method of hemorrhage control, being conducted very much along the same lines as though the uterus were being excised in either its normal, or reversed axis, or by hemisection.

(*a*) **Total Vaginal Hysterectomy by Clamp Control of the Broad Ligaments in their Normal Axes.**—The general features of the operation, as far

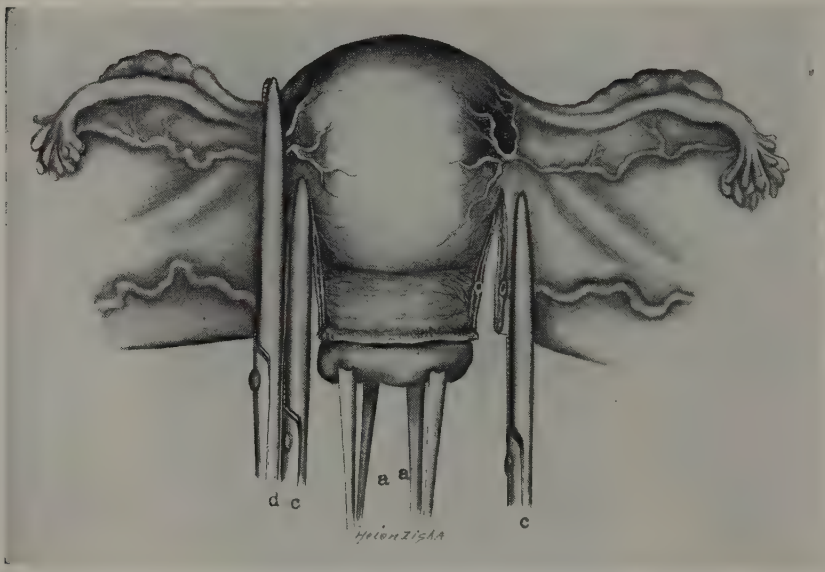


Fig. 5862.—The Same _ II; _ Diagrammatic representation of the continuation of the lateral clamping and division: _ a, a, Tractors of the cervix; _ c, c, lowermost clamps of the lower part of the broad ligaments, including the uterine vessels; _ d, upper, right clamp, of the upper part of the broad ligament, including the ovarian vessels.

as the cutting is concerned, from beginning to end is the same as that described in the vaginal removal of the uterus, with the organ in its normal axis (v. p. 462). A cuff of vaginocervical mucosa is incised and turned back _ and, along with the bladder, is displaced upward _ after which the vesico-uterine and recto-uterine peritoneal pouches are incised through the anterior and posterior vaginal fornices. From this stage onward the clamp feature of the operation comes into execution. The cervix is drawn well downward by the grip of the vulsellum, and the broad ligament structures on each side of the cervix are clamped, first on one side, and then on the other, by strong, rather long-limbed clamp forceps (Fig. 5861). The elevation of the bladder, tending to elevate with it, as it does, the ureters _ and the application of the clamps very close to the cervico-uterine wall _ are the chief reliances against the inclusion of the ureters in the clamps. The possibility of clamping the ureters and the danger of hemorrhage from the premature slipping of the

clamps, or from bleeding after the clamps have been removed, constitute the chief hazards of the clamp operation.

After the first pair of clamps have been applied and firmly closed, under the direction of the fingers, the portion of the broad ligament thus controlled on each side is divided with stout scissors, between the clamps and the uterus, loosely hugging the latter, and not letting the division extend quite to the extreme limit of the tissues controlled by the clamps. When this section has been made on both sides, and the cervix is drawn further down, a still higher portion of the broad ligaments on each side will be brought within clamping distance – and a second pair of clamps are applied to these, the more median portions of the broad ligament structures – without removing the first pair of clamps. All closures of clamps are conducted under the guidance of the

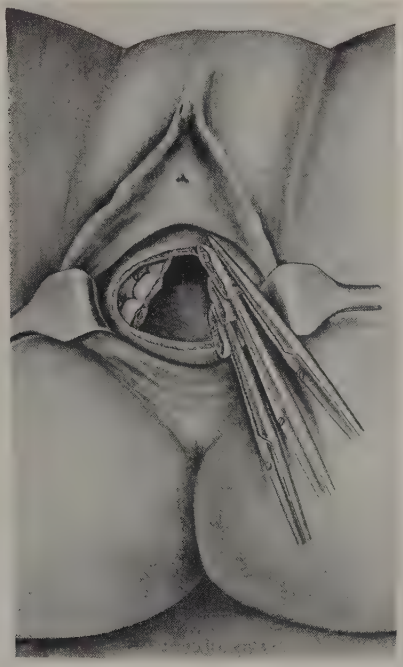


Fig. 5863.—The Same – III; – Uterus has been entirely removed – and three hemostatic clamps, controlling the divided segments of the broad ligaments, are seen on the left side. The vaginal wall will be so sutured around as to include these segments of the broad ligament pedicle.

fingers. The uterine vessels may be included in the upper part of the tissues grasped by the first pair of clamps – or in the lower part of the tissues clamped by the second pair. When the tissues controlled by the second pair are divided, the uterus can be drawn very much further out. Sometimes only a single pair of forceps has been used upon each side – generally, however, at least two pairs are employed upon each side (Fig. 5862) – and, most frequently, three pairs. The third or highest pair of forceps will come up flush with the uppermost limits of the broad ligaments, excluding the appendages (unless these are to be removed) and the utero-ovarian vessels. The structures held in the third clampings are then divided – when the uterus comes away (Fig. 5863).

A thorough digital examination should be made, after the removal of

the uterus _ to see not only that the clamps have taken good holds _ but also to see that they have not included any other tissues, especially intestinal, not intended to be included.

It is a comfort in all these cases _ but especially in the clamp operation, if the ureters have been previously catheterized, and the instruments left *in situ*, so that their presence may serve as a guide during the manipulations.

Ordinary long-handled, straight clamps may be used, but special clamps, with detachable handles, such as Pryor's, are particularly useful in these cases, as the handles may be detached at the end of the operation, while the clamps are being worn, and reattached at the time of their withdrawal.

The handles of the clamps _ or the detached blades _ are surrounded by rolls of gauze in their exit from the peritoneovaginal wound and from the lips of the vagina (Fig. 5864) _ for the two days they usually remain *in situ*.

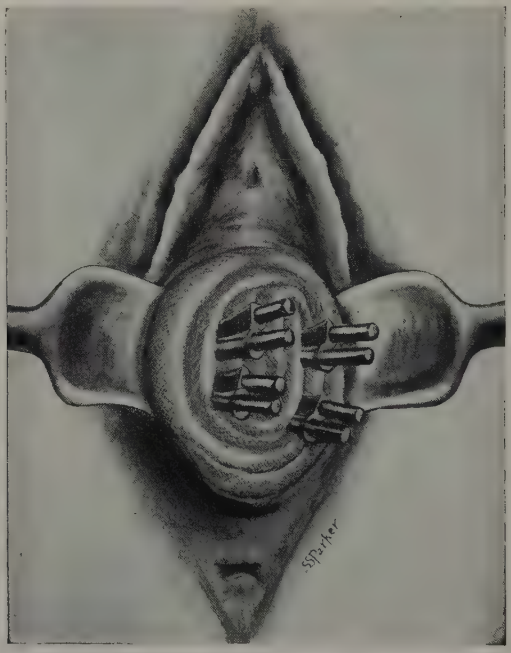


Fig. 5864.—The Same _ IV; _ Four of the Pryor type of clamps, with detachable handles, surrounded by rolls of gauze, are shown protruding from the vagina.

At the time of their withdrawal they are not abruptly unclamped _ but by very gradual degrees, stopping between, so that if any bleeding occur, it may make itself known _ and, under such circumstances, the clamps are again tightened, or the special one from whose vicinity bleeding comes _ to remain another day or two.

Besides anchoring the broad ligament pedicles to the sides of the vagina, it is well to place a few interrupted sutures, before placing gauze about the clamps _ inserting the sutures _ but leaving them untied _ to be tied upon the withdrawal of the clamps, or to be tied up to a space left for the exit of a temporary drain.

Comment.—The initial incision should entirely surround the cervix, and not merely transversely incise the anterior and posterior fornices, for if any portion of the uncut vaginal wall be caught in the clamps, the pressure

of the clamps upon the unsevered vaginal wall will cause pain. Crossen especially stresses this point _ and makes the vaginal incision extend outward, on each side, to avoid clamping uncut vaginal wall _ and gains extra working room by extending it medially along the anterior cervicovaginal wall for a short distance.

He also emphasizes the importance, in completing the operation, to suture the vaginal wall to the pedicles, including oozing tissue anterior to the rectum, so as to narrow the vagina and prevent tendency to hernia _ and calls attention to the fact that as the tissues beyond the clamps are expected to slough, the clamps and their clamped pedicles should be drawn down either into the vagina, or so as to be extraperitoneal, the accomplishment of which is aided by suturing the vaginal wall up around the clamps and pedicles _ and this is made easier by well isolating the broad ligaments and stretching them before

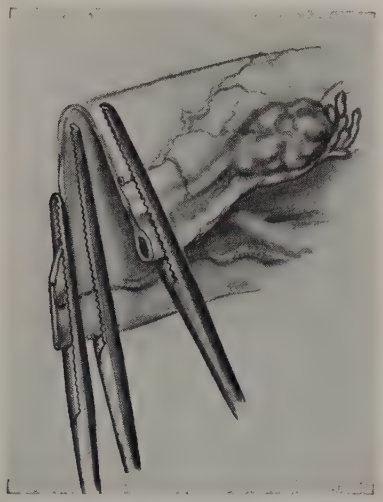


Fig. 5865.—Total Vaginal Hysterectomy by Clamp Control of the Half-reversed Broad Ligaments After Delivery of the Uterus; _ Diagrammatic illustration of the manipulation of the broad ligaments _ the lower halves of the broad ligaments have been clamped and divided with the uterus *in situ*. The fundus is then delivered through the opening in the anterior fornix, bending the upper aspect of the broad ligaments forward, and the upper halves of the broad ligaments are clamped and divided. While the fundus is being delivered the freed cervix slips backward into the vagina, but the lower clamps project from the vaginal outlet.

the clamps are applied. Another object in suturing the vaginal walls to the pedicles is to prevent their retraction after the removal of the clamps.

A firm vaginal pack, in connection with and including the clamps, is indicated _ so as to lessen the risk of hernia, in expulsive efforts, during the retention of the clamps, and until the wound is solidified. The uterus is kept firmly packed with gauze during the healing, following the withdrawal of the clamps.

(*b*) **Total Vaginal Hysterectomy by Clamp Control of the Half-reversed Broad Ligaments, After Delivery of the Uterus.**—This is an application of the clamp method of control to total vaginal hysterectomy of the intact uterus, delivered in its reversed axis, through an anterior colpoperitoneotomy incision (v. p. 471). The lower clamps are applied, on each side, exactly as above described _ taking in the lower half of the broad ligament, which is then divided between clamps and uterus. The fundus of the uterus is then

delivered through the vaginoperitoneal incision – after which the upper clamps, one on each side, are applied to the upper halves of the broad ligaments – which are then divided between clamps and uterus. The upper halves of the broad ligaments are then folded forward and downward upon the lower halves (Fig. 5865). The four clamps are then brought out of the peritoneovaginal wound exactly as in the above method – and the wound treated in the same manner as there described.

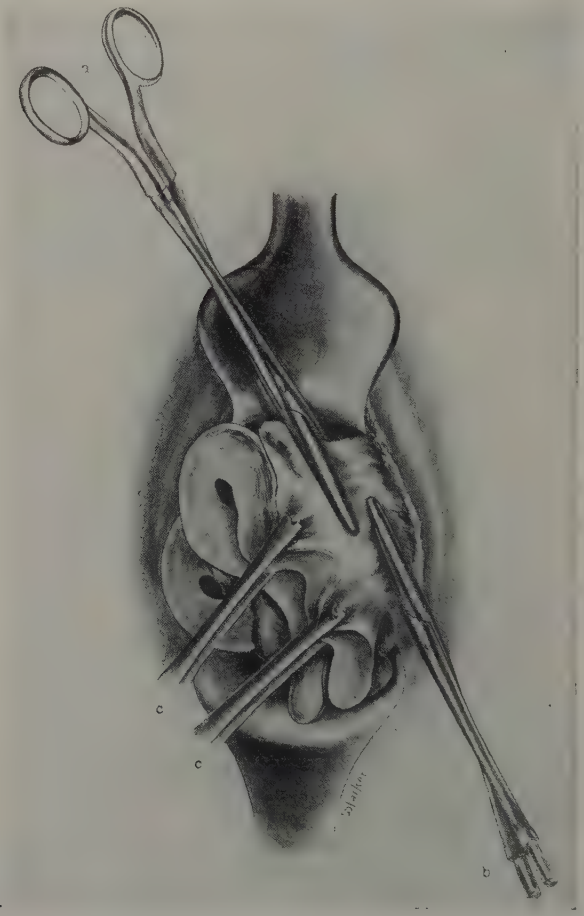


Fig. 5866.—Total Vaginal Hysterectomy by Median Hemisection Through an Anterior Colpoperitoneotomy Incision, with Clamp-control of the Broad Ligaments; – Having divided both walls of the uterus medially, in the act of delivery, each half is dealt with in turn: a, Pryor's detachable-handle clamp grasping ovarian vessels and half of broad ligament from above; – b, another, clamping uterine vessels and half of broad ligament from below. The upper half of the broad ligament will be folded upon the lower half when division between clamps and uterus is made; c, c, forceps grasping the left half of the uterus.

This latter form of applying the clamps is sometimes employed in vaginal hysterectomy performed by one of the methods of morcellation.

Another field for the application of the clamp method is sometimes found in vaginal hysterectomy performed by hemisection (Fig. 5866). This may be the case where adhesions constitute difficulties, or where the patient's

condition indicates the need of greater haste than is possible with the ligation method. The upper and lower halves of the broad ligaments, of each side, are clamped, the handles of the clamps pointing in opposite directions _ after which the upper half of each ligament is folded downward upon the lower half _ and the broad ligament pedicles and the clamps then treated as in the ordinary technic.

TOTAL VAGINAL HYSTERECTOMY BY MORCELLATION

Description.—The process of removing the uterus through the vagina by morcellation, "par morcellement," or by piecemeal, is sometimes made use of where a disparity of size exists between the uterus alone, or the uterus and its tumor, on the one hand, and of the vagina, on the other _ or because of adhesions _ either one of which causes, if marked, may prevent the delivery of the uterus into the vagina, even by methods of hemisection, with or without version. The chief scope of the operation of morcellation is in connection with uteri involved by fibromyomata. In many instances the uterus which must be literally broken up, or cut up, and dug out, had better be removed by the abdominal route by more careful surgical technic. The operation is now rarely performed.

Some of the special methods of morcellating the uterus by the vaginal route will be described below.

Preparation _ Position _ Landmarks.—As in other methods of vaginal hysterectomy.

Operation.—There is a number of different ways of conducting morcellation _ but the same principle runs through them all _ namely, to first remove some median portion of the uterus, or uterus and tumor, in the direction of the median uterine axis _ so that through the room left by this median removal access may be had to the more laterally lying aspects of the uterus or uterine mass. From the mechanical standpoint the method pursued in hysteromyomectomy is one of decentralization, very much akin to the boring out of the center of a fibroid in vaginal myomectomy. The salient safeguards throughout are the known positions of the bladder, the rectum, and the uterus _ verified, if necesstry, by a sound in the bladder, finger in the rectum, and the previous catheterization of the ureters _ with, after the peritoneal cavity is exposed, the occasional corroboration of progress and position by intraperitoneal digital examination.

(*a*) **Vaginal Hysteromyomectomy by Morcellation in Small Segments Until the Main Uterotumor Mass Can Be Delivered.**—The initial steps are the same as those for an ordinary vaginal hysterectomy of the uterus in its normal axis (v. p. 462) _ the circular division of the vaginal wall over the cervix _ the freeing back of the vaginal cuff, including the bladder _ and the opening of the peritoneal cavity through the anterior and posterior fornices. The cervix is seized by two rather heavy, laterally placed vulsellum forceps and drawn downward and outward. The Surgeon forms, usually, some fixed plan or "figure" segmental excision in his mind. A conventional one is that shown in Fig. 5867 _ an elongated form of V, involving the anterior wall of the uterus. A simple median incision is often made. The basal feature of the procedure, in removing consecutive pieces of uterine tissue, of lozenge, or other form, is, after seizing the piece with clamp forceps, which it is immediately planned to remove, not to entirely sever this piece from the main portion of the uterus until another pair of clamp forceps has seized the next higher or adjacent piece of uterine tissue _ otherwise the part which it is desired to next remove may recede out of easy reach. An equally important technical point is to

follow out a plan of removing pieces of uterine tissue lying in, approximately, the line of the median longitudinal axis of the uterus – so that the transverse measurement of the body of the uterus will be thereby narrowed. Working upon these two principles, one continues to remove additional pieces of uterine tissue – either of the uterine wall alone, or of the uterine wall and involving fibromyoma – until sufficient tissue has been removed to allow the uterus either to be drawn much further downward in its normal axis, or be reversed by delivering the partly emptied fundus through the vaginal incision into the peritoneum – or until the operation, begun according to the technic under consideration, may be more wisely ended by one of the methods described under

Fig. 5867.—Vaginal Hysteromyomectomy By Morcellation in Small Segments, Until the Main Uterotumor Mass Can Be Delivered – semidiagrammatic.

b or *c*. It is of no importance as to the shape of the pieces of tissue removed, but they should be removed alternately from areas immediately adjacent to the median line, constituting an alleyway – the removal being best accomplished by clamp forceps and stout, curved scissors with moderately blunt points. The bladder and ureters in front, and the rectum behind, should be constantly under observation, to preserve them from harm. After the more or less collapsed uterus has been delivered into the vagina, its excision is accomplished in the same manner as described under vaginal hysterectomy in its reversed axis (v. p. 471).

(*b*) **Vaginal Hysterectomy, or Hysteromyomectomy, by Hemisection and Morcellation.**—The essential elements of this operation are the same,

as far as the process of morcellation (v. s.) are concerned _ with the added feature of hemisection. If the associated tumor be of the anterior uterine wall, this is usually primarily incised _ or if of the posterior, the posterior. Sometimes it is indicated to make a certain amount of progress on the posterior wall, and then completely incise, medially, the anterior wall, and then make the rest of the attack upon the posterior wall through the opened uterus. The bladder and ureters, in front, and rectum, behind, are especially guarded. Any question of doubt about the bladder should be settled by sound. It is helpful when the uterus can be split up to the tumor mass, and the fibroid or fibroids shelled out, thereby giving much additional working room. The uterus should be vertically split as soon as this is accomplishable. This, preferably, is done after delivering the body of the partly collapsed uterus into the vagina _ and is then more safely and more easily accomplished.

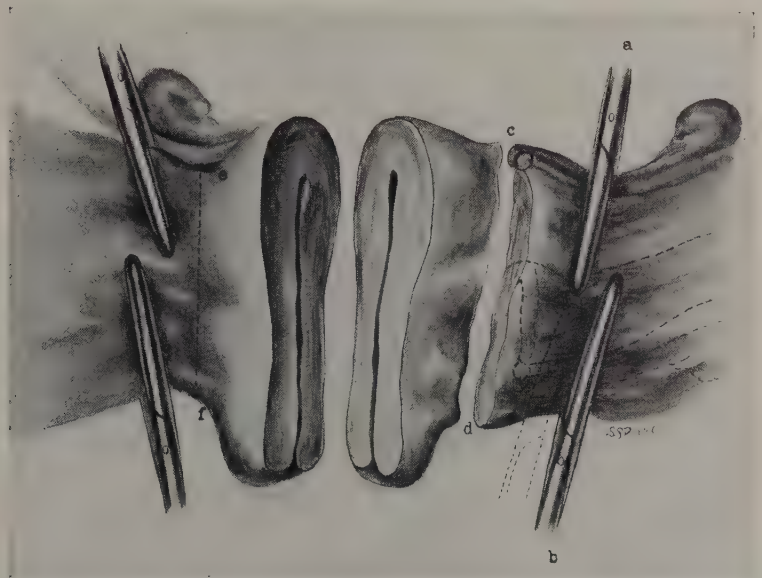


Fig. 5868.—Vaginal Hysterectomy, or Hysteromyomectomy, by Hemisection and Morcellation; _ The hemisection and the method of dealing with the broad ligaments are here alone shown diagrammatically. The preceding partial diminution of the size of the uterus by morcellation is conducted along general lines.

But it may have to be done from the cervix upward in the progress of the operation _ but should not be undertaken unless a finger introduced through either the wound in the anterior or in the posterior vaginal fornix first guards the blade of the scissors which is within the peritoneal cavity _ the opposite blade being either within the uterine cavity or pushed into some centrally lying portion of the uterus. There is usually relatively little hemorrhage in these operations, where the sections are made medially into the uterus, until the lateral walls of the organ are relieved of pressure, thus giving the uterine tissues a chance to bleed.

When the uterus is entirely split in its middle line, irrespectively of the stage at which this is accomplished, the delivered halves of the uterus render the necessary manipulations of the broad ligaments very much easier (Fig. 5868). Having determined whether the appendages of the uterus are to be

included in the removal, or left, the method of control of the broad ligaments is decided. Ligation with distal division is always more surgical. Or (and especially if haste be indicated) the ligaments may be clamped by one or more clamps, on each side, from below, upward, in its normal position _ and the clamps temporarily left in the vagina. Or a clamp may be applied above and below, on each side (v. Fig. 5866, **a** and **b**) _ after which the upper clamp folds the upper half of the broad ligament upon the lower half _ the clamps being temporarily brought out of the peritoneovaginal wound _ as in the manner described under the clamp method of vaginal hysterectomy.

(*c*) **Vaginal Hysterectomy, or Hysteromyomectomy, by Special Form of Hemisection and Morcellation** _ Faure.—This method has been employed

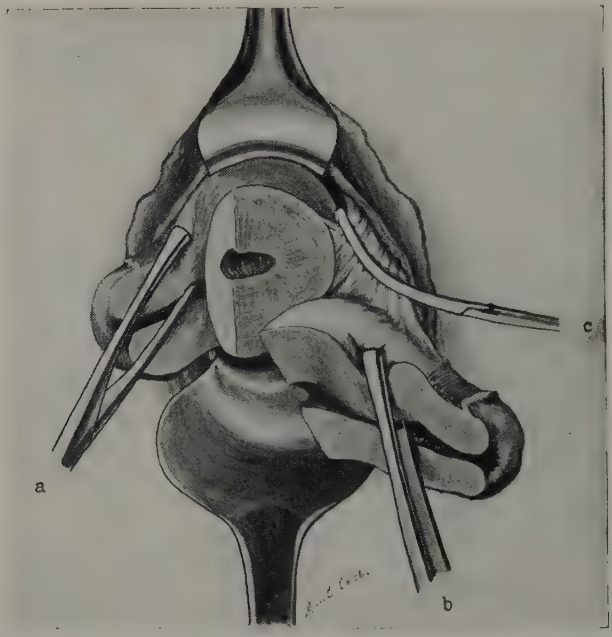


Fig. 5869.—Vaginal Hysterectomy, or Hysteromyomectomy, by Special Form of Morcellation and Hemisection _ Faure; _ The lower portion of the uterus is first medially split _ the cut diverging upward and outward, dividing these portions from the uppermost part of the fundus, thereby giving access to the rest of the fundus and to the broad ligaments.

where, after median section of the cervix and of the lower portion of the body of the uterus, it has been impossible to deliver the fundus, or gain access to the upper portions of the broad ligaments _ chiefly due to size or adhesions. In these cases an oblique upward section is made to either side, from the upper limit of the vertical section into the beginning of the broad ligaments. This mobilizes the two halves of the lower portion of the uterus. These are manipulated, so that their portions of the broad ligaments can be either tied and divided or clamped. After the removal of the two freed portions access is thereby gained to the upper parts of the broad ligaments and the remaining portion of the fundus (Fig. 5869).

RADICAL VAGINOPERINEAL HYSTERECTOMY BY VAGINOPARAVAGINAL INCISION

SCHUCHARDT-SCHAUTA

Description.—This represents the most radical form of operation for cancer of the uterus performed by the vaginal route or by the combined vaginal and paravaginal routes. Both the uterine and para-uterine (parametrial) tissues are removed through the combined incisions. It was devised by Schuchardt _ and improved and enlarged upon by Schauta and others. The essential feature of the procedure is, by means of an incision passing through the left wall of the vagina and the perineopelvic floor, to obtain the maximum room for vaginally excising the uterus and the adjacent involved parametrial tissues. The removal of the parametrium constitutes the salient feature of the radical operation.

The special field for this major procedure has been considered to be cases of uterine cancer in which the stoutness of the patient's abdominal wall added difficulties, because of such stoutness, to operation by the abdominal route. Apart from the fact, however, that the vaginal outlet, perineal, and gluteal structures are also apt to be encumberingly enlarged in just the same type of patient, the majority of Surgeons would probably prefer abdominal hysterectomy. The laterally placed pelvic lymphatic structures are not, of course, removable by the vaginal route.

Preparation _ Position _ Landmarks.—As for vaginal hysterectomy, in general, together with those of the rectum and perineum.

Parametrium.—The space on each side of the upper part of the vagina, around the cervix, and passing upward and outward between the layers of the broad ligaments, occupied by loose areolar tissue, lymphatics, and blood-vessels.

Incision.—The incision of approach is curvilinearly vertical, placed to the left, beginning in the left vaginal vault, crossing the left margin of the vagina, and ending upon the left side of the sacrum _ following the course shown in Fig. 5870 _ and described, in detail, below.

The description and illustrations below are modified from Faure et Siredy and from Crossen.

Operation.—Following anesthesia the cervico-uterine canal is curetted and swabbed with tincture of iodin. Any visible site of involvement is curetted and cauterized. A strip of gauze is packed into the uterine cavity. The vagina is swabbed with a part-strength tincture of the iodin. After these preliminaries fresh gloves are drawn on.

To further protect the wound from possible contamination the cervical canal is closed by suture. This may be accomplished by simply suturing together the opposite lips of the canal. Or this may be first done, and then a tcircular or elliptic cuff of vaginal tissue may be raised _ safelycircumscribing he diseased region by a wide margin _ after which the lips of the cuff are turned forward (outward) and sutured together. Or the cuff of vagino-cervical tissue may be raised and sutured over the cervix without first suturing the lips of the cervix together (Fig. 5871). In proportion as the vagina must also be removed is the circular incision around the vagina placed lower down, toward the vaginal outlet. The entire vagina may have to be excised. In average cases at least the upper third of the vagina is removed. Owing to the difficulty of manipulating the tissues in this part of the technic, Crossen suggests seizing with several clamp forceps the portion of the vaginal wall which will lie inside of the circular incision _ so that these forceps may be available for manipulating the margins of the cuff in the subsequent suturing.

The margins of the middle third of the cuff are first sutured with stout silk – then the outer thirds – leaving the sutures long, as tractors. All objects touched up to the closure of the flap over the cervix are now exchanged for fresh ones.

It is presumable that when the operation has progressed this far that the rest of the procedure will be carried out – but at this stage the digital investigation can be carried still further before determining upon the final operability of the condition. For this purpose the bladder is pushed upward from the cervix to gain better access to the uterus, and the peritoneal cavity is

Fig. 5870.—Radical Vaginoperineal Hysterectomy by Vaginoparavaginal Incision – Schuchardt-Schauta – I: – a, a, Raising a vaginal cuff to be sutured over the cervical opening; – c, vaginoparavaginal incision.

entered through the anterior fornix. If the resulting examination shows adjacent adhesions, extensions, and involvements, the operation may be modified, to include simply the excision of the already freed vaginal cuff and part of the cervix by cautery thermocoagulation. If not contraindicated the radical operation is proceeded with.

The incision, passing throughout upon the left side, begins at the junction of the left lateral and lower aspects of the cuff incision around the cervix (or, when the cuff protection of the cervix is not used, at the junction of the left lateral and lower aspects of the cervicovaginal junction). It passes thence, in slight curvilinear fashion, downward and outward through the left

vaginal wall, crossing the left border of the vagina about on a level with the lower end of the labium minus. The paravaginal portion of the incision still passes, after crossing the margin of the vaginal outlet, in slight curvilinear sweep, through the skin and fascia of the left perineal, para-anal, and ischiorectal regions (far enough to the left to avoid injuring the anus and rectum – about 2.5 cm. or 1 inch outside of them) – to end either opposite the anus – or to be extended, if need be, to the left border of the sacrum. The incision passes rapidly throughout its course, dividing the tissues of the perineum, ischiorectal fossa, the left levator ani, and coccygeus – severing the pelvic diaphragm – exposing the left broad ligament – and opening up the dome of the vagina. A number of artery clamps are immediately applied to the

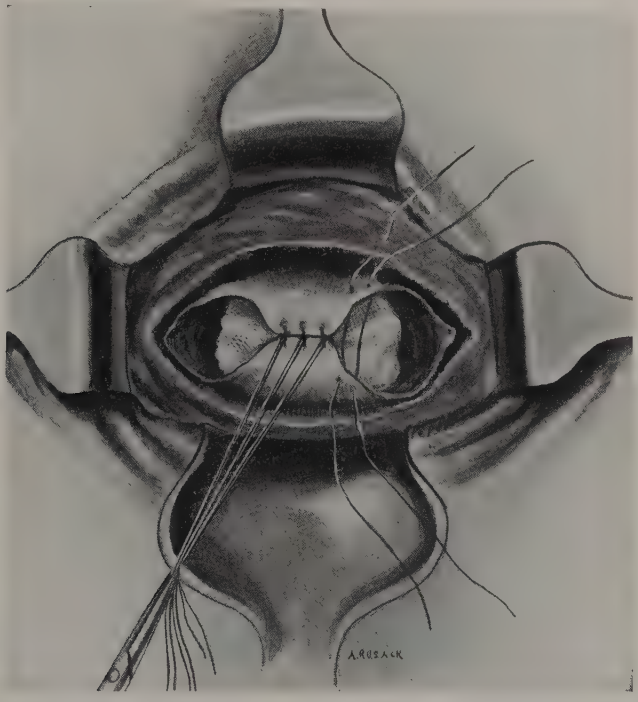


Fig. 5871.—The Same – II; – The cervix has been surrounded by an elliptic incision preliminarily to raising a protective mucosal flap to be sutured over the os. The opposite margins of this flap are being sutured together by several segmental sutures of strong silk – which will be subsequently used as temporary tractors.

bleeding vessels, which are at once tied – and the rather extensive wound may be then temporarily tightly packed with gauze to controf further minor oozing. A weighted or hand-held posterior vaginal retractor still further controls bleeding.

Some Operators make the paravaginal incision first – and, after controlling the bleeding from this, proceed to make a circular incision through the vaginal wall at the junction of its upper and middle thirds – dissecting up the cuff of vaginal wall thus circumscribed, and suturing it over the cervix, as already described, and leaving the ends long as tractors of the thus protected cervix.

The bladder is now freed from the cervix chiefly by blunt dissection through the upper part of the vaginal incision previously circumscribing the cervix – and it, with the attached ureters, are retracted upward from the cervico-

uterine wall _ and laterally, from the parametrium. It is especially desirable to accomplish this as nearly as possible by blunt dissection. This upward displacement of the ureters is necessary in order to reach and ligate the uterine vessels which cross to the uterus immediately above them. Crossen stresses the point that if pathologic infiltration from the focus of disease do not involve the region of the ureters, they are carried upward (and outward) with the upward retraction of the base of the bladder, and may not be encountered in the field at all _ while, on the other hand, if they be held down by infiltrative processes, they will not follow the base of the bladder upward, and are then

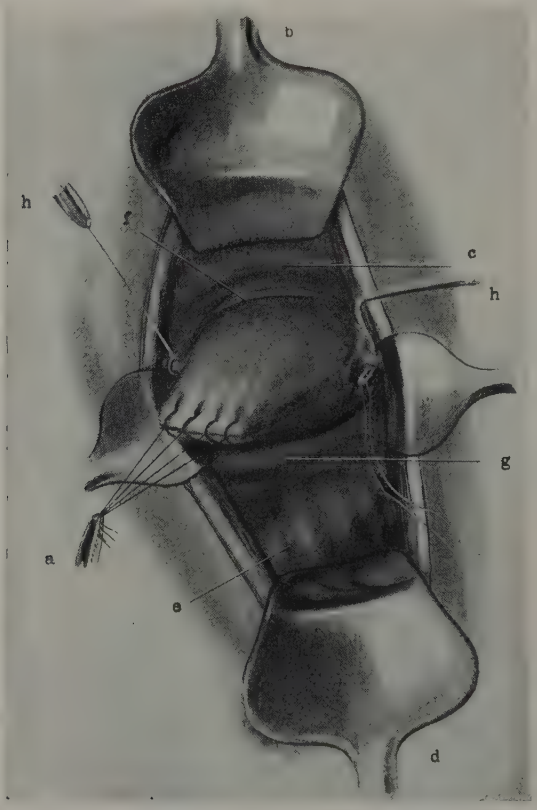


Fig. 5872.—The Same _ III: _ **b,** Upper vaginal retractor; _ **d,** lower retractor in the paravaginal wound; _ **a,** outward traction of the uterus through the tractor sutures placed in the margins of the vaginal cuff, which has been sutured over the cervix; _ **c,** upwardly displaced bladder; _ **f,** margin of opening in aterior vaginal fornix; _ **g,** border of incised posterior vaginal fornix; _ **h, h,** ligation of the uterinne vessels.

due to be encountered in the field, and may even be seen. The key to the situation here, he holds, is to keep within the connective-tissue plane between the bladder and the uterus _ and, to keep within it, not to hug the uterus too closely, for fear of injuring the bladder _ but to separate the bladder lightly, which also insures leaving diseased parametrium adhering to the discarded uterus rather than to the retained bladder.

The combination of upward retraction of the bladder and attached ureters, no the one hand, and the downward traction of the uterus, on the other, naturally lead to the exposure of the uterine vessels, passing inward through

the lower lateral aspects of the broad ligaments. As the ureters pass upon a lower plane than (that is, beneath) the uterine vessels, and as the approach is made from below, it must be know, before conducting and tying the ligatures, that the ureters have been displaced outward and upward, so that the ligatures can be applied between them and the uterine wall or, at least, well to either side of the position of the ureters (Fig. 5872). If there be any difficulty in clearly determining the position of the uterine vessels, the peritoneum should be opened (if not already incised) through the anterior vaginal fornix, to enable the anterior aspect of the broad ligament to be palpated _ or the broad

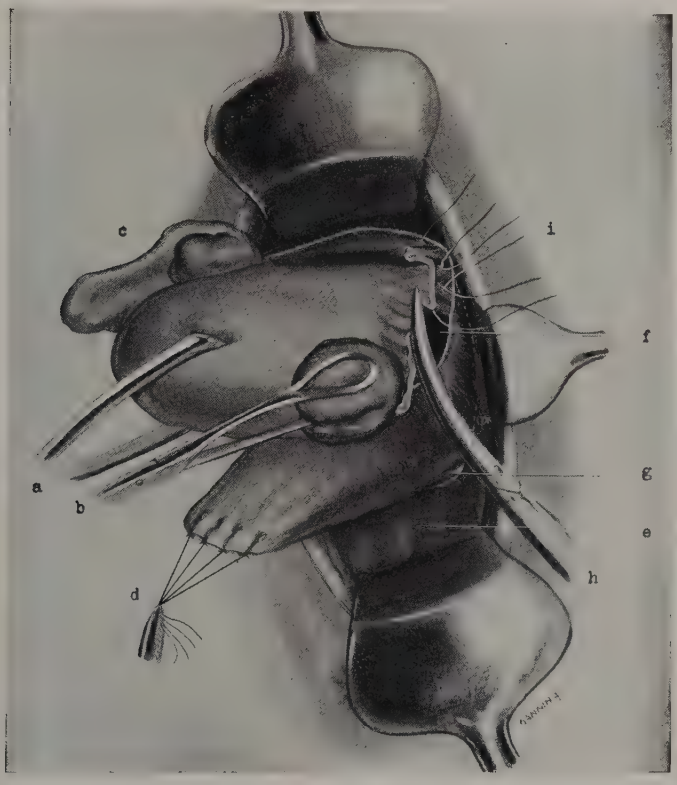


Fig. 5873.—The Same _ IV: _ **a,** Fundus uteri reversed and drawn through the incised anterior vaginal fornix; _ **b,** left tube and ovary; _ **c,** right tube and ovary; _ **d,** sutured cervix about to slip backward into the vagina as the fundus is brought forward; _ **e,** paravaginal wound; _ **f,** incised anterior fornix; _ **g,** incised posterior fornix; _ **h,** division of left broad ligament between ligatures and uterus; _ **i,** placing and tying of the broad ligament ligatures, prior to division of the broad ligament. The lateral vaginal fornices will be divided along the dotted line between **f** and **g,** thus liberating the uterus.

ligament should be exposed through both the anterior and posterior vaginal fornices and be palpated between thumb and first finger, to locate the vessels.

If the veisco-uterine peritoneal pouch have not been already transversely incised, in transversely curvilinear fashion, through the anterior vaginal fornix, this is now done _ finally separating the bladder and ureters from the uterocervical wall and parametrium. Similarly, the recto-uterine perineal pouch is incised, in a correspondingly curvilinear fashion, through the posterior vaginal fornix _ and the rectum separated from the cervix and parametrium. The connecting incisions through the anterior and posterior vaginal

fornices are shown in Fig. 5873. The uterus now remains connected only by the broad ligaments, parametria, and adnexa.

The paravaginal and para-uterine (parametrial) tissues are now removed as throughy as possible outward toward the walls of the pelvis. This is made possible by the previous ligation of the uterine vessels _ the rest of the bleeding to be anticipated at this stage being from the middle hemorrhoidal arteries and from venous sources. The separation is carried on as largely as possible by blunt dissection. Vessels which can be ligated are controlled by ligature. Other bleeding structures may be clamped, the clamps being left on temporarily, and the part seared with the thermocautery before the

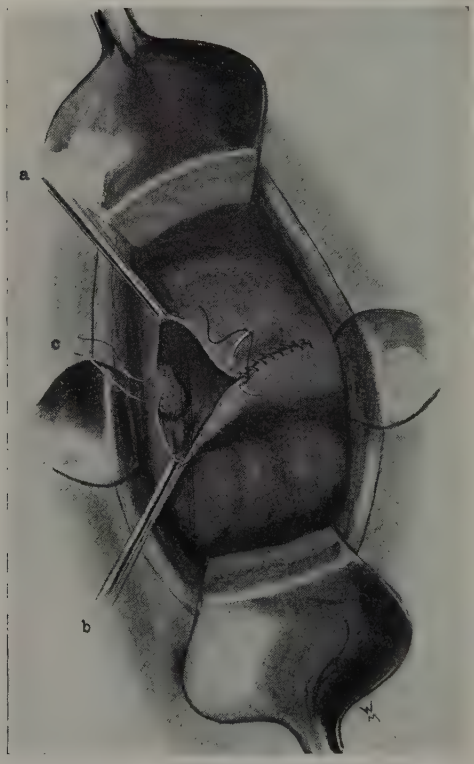


Fig. 5874.—The Same _ V: _ a, b, Suturing the peritoneovaginal margins; _ c, anchorage of the right broad ligament stump near the vaginal outlet. Temporary drainage will be established in an unsutured part of the tract.

Fig. 5875.—VI; _ The sutured wound, with comparatively large drain.

clamps are released. Venous bleeding may often be stopped by temporary gauze packing. Schauta's technic is to pack gauze against the bleeding structures of one side while working on the opposite _ rather than to clamp or ligate before division, as the latter methods tend to leave too much parametrial tissue behind. Where, however, clamp control is employed, the parametrial tissues are first drawn as well outward from the sides by one pair of forceps, then grasped by another, placed still further outward, then divided, and finally seared.

When these steps have been carried out, the fundus of the uterus is then brought out of the pelvis, through the incised anterior fornix. The axis of

the body of the uterus, together with the upper part of the broad ligaments, is thus reversed — and, in this position, the ligaments of the two sides are ligated and divided in segments from fundus toward cervix (v. Fig. 5873). The ligatures include (are outside of) the ovaries and tubes, which usually come away with the uterus. On the other hand, the adnexa may be left. The broad ligament ligatures are left long. When the broad ligaments have been completely tied off and divided, the uterus is free, the cervix having been encircled by the curvilinear incisions made through the anterior and posterior fornices, into the peritoneal cavity, and meeting in the lateral fornices of the vagina — and is removed.

The ligated pedicles of the segments of the broad ligaments are either sutured together in the median line — or are anchored just within the peritoneovaginal opening (v. Fig. 5860). If clamps have been used instead of ligatures to control the broad ligaments, and it be desired to leave these *in situ*, they are temporarily brought out of the vagina, protected in gauze wrapping, in the usual manner. Finally, the anterior and posterior margins of the peritoneum, including the corresponding borders of the remaining vaginal wall, are brought together by chromic catgut sutures, from the two ends, toward the middle. Through the center of the partly sutured vaginal vault a substantial temporary gauze drain is carried into the peritoneal cavity (Fig. 5875)

The paravaginal wound is sutured by buried chromic sutures, repairing the structures divided early in the operation — and by superficial sutures of silkwork filament.

Comments.—The structures of the broad ligaments are sometimes ligated while these are *in situ* — or may be ligated, as above, after the version and delivery of the uterus.

The iliac lymphatic glands cannot be removed by the vaginal route.

The operation is difficult. And it must be evident that pelvic lymphatic tissues can be less carefully and technically removed by this method than by the abdominal operation.

The chief field for the present operation is constituted by the presence of circumstances contraindicating the use of the abdominal route.

CHAPTER XC

OPERATIONS UPON THE FEMALE INTRAPERITONEAL ORGANS, THROUGH THE INGUINAL CANALS

Operation for retrodisplacement of the uterus by the extraperitoneal shortening of the round ligaments through the inguinal routes (Alexander), p. 508.

Operation for retrodisplacement of the uterus by the extraperitoneal shortening of the round ligaments, after exposing the peritoneal cavity through the inguinal routes (Alexander-Adams-Goldspohn-McKay Technic), p. 515.

OPERATION FOR RETRODISPLACEMENT OF THE UTERUS, BY THE EXTRAPERITONEAL SHORTENING OF THE ROUND LIGAMENTS THROUGH THE INGUINAL ROUTES

ALEXANDER

Description.—The round ligaments are exposed in the inguinal canals, extraperitoneally _ between the internal abdominal rings and their final distribution in the labia majora. By means of the proximal portions of the ligaments the uterus is drawn forward, while the peritoneum surrounding the ligaments is pushed back into the cavity unopened _ the uterus being permanently held forward by suturing the distally divided ligaments into the musculo-aponeurotic structures of the abdominal wall of the inguinal region. The peritoneal cavity, in the original type of the Alexander opration, is not opened.

Advantages.—Avoids the necessity of opening the abdomen _ does not interfere with pregnancy _ and is an excellent operation for uncomplicated retroversion or retroflexion, especially in the young.

Disadvantages.—Impracticable unless the uterus and adnexa be freely movable _ unsatisfactory in the presence of poorly developed round ligaments, especially where these are atrophied in advancing age _ affords no opportunity of examining the condition of the intrapelvic structures _ difficulty, often present, of finding the round ligaments _ tendency of the technic to only draw the uterus forward, without elevating it (owing to the fact that the central portion of the round ligaments is lower than the uterine ends and, therefore, tends to slightly depress the fundus _ Chipman). All in all, the operation is probably not as efficient, mechanically, as some of the intra-abdominally performed procedures for drawing the uterus forward and upward _ and does not admit (as ordinarily performed) of examination and correction of intrapelvic conditions which may be present (v. p. 515).

Preparation.—Shaving and disinfection of the abdominal wall and inguinal regions.

Position.—Horizontal dorsal decubitus.

Landmarks.—Those of the canals of Nuck and their inner and outer openings _ corresponding with the inguinal canals in the male, and the internal and external abdominal rings.

Anestheisa _ or Analgesia.

Operation.—The steps of the operation, up to the freeing of the round ligaments, are very similar to those carried out in exposing the spermatic cords in the inguinal canals in operating for oblique inguinal hernia in the male. The description and illustration of this and the following operation,

as carried out in considerable detail by McKay and by Kroenig, will be here summarized in modified form.

The incision is placed parallel with Poupart's ligaments and 1.2 cm. ($\frac{1}{2}$ inch) above it – beginning 1.2 cm. ($\frac{1}{2}$ inch) outside of the pubic spine, and extending toward the iliac spine for about 4 cm. ($1\frac{1}{2}$ inches) – or as much further as may be needed by the thickness of the abdominal wall, or the difficulties experienced after the operation is begun. Some Operators undertake to carry out the procedure through an unnecessarily limited incision.

The preliminary incision passes through the skin only. Two small wound hooks are then placed in the center of the superficial fascia and are drawn

Fig. 5876.—Alexander's Operation for Retrodisplacement of the Uterus by the Extraperitoneal Shortening of the Round Ligaments Through the Inguinal Canals – I; – The superficial epigastric and superficial circumflex iliac vessels have, in this case, been ligated (instead of retracted). The aponeurosis of the external oblique muscle is being divided upon a grooved director passed through the external abdominal ring and made to hug the under surface of the muscle in its outward and upward passage toward the anterior superior iliac spine.

away from each other, toward the limits of the wound. In this way McKay draws to either side the superficial epigastric and superficial iliac which run in the superficial fascia, above the deep inguinal facia – thereby avoiding the necessity of placing four ligatures upon the cut vessels of each side. The majority of Surgeons simply cut these vessels in the course of the incision, and tie them. The deep layer of the inguinal fascia is next limitedly incised, and the hooks similarly applied – and, when drawn to the two ends of the wound, will have cleared it in its entirety, down to the aponeurosis of the external oblique, its white fibrous marking being seen running parallel with Poupart's ligaments. Ordinarily this progress is made at the initial incision with one sweep of the knife – but the vessels mentioned have then to be quadruply clamped and tied on each side.

The next rallying point is the external abdominal ring. This is found by first locating the pubic spine, to which the columns of the ring are attached. The inguinal canal runs outward and upward from this point, above Poupart's ligament, toward the anterior superior iliac spine. The upper and lower margins of the wound are here well retracted – and the external abdominal ring usually recognized by a small mass of fatty areolar tissue protruding from its opening.

The usual method of incising the roof of the inguinal canal, which is composed of the aponeurotic fibers of the external oblique, the upper surface of which is crossed by more or less distinct intercolumnar fibers, is to pass a straight grooved director through the external abdominal ring, beneath the aponeuro-

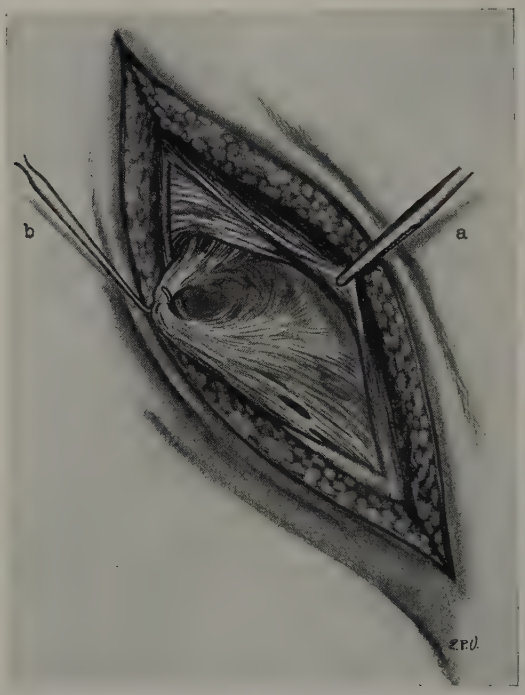


Fig. 5877.—The Same – II; – Picking up the more loosely associated fibers of the distal aspect of the round ligament with forceps preparatorily to isolating its more proximal portion – in another method of mobilizing the ligament, where it does not express definite structure and is hard to isolate: a, External oblique; – b, frayed-out fibers of the round ligament.

sis of the external oblique, whose under surface it closely hugs in its outward passage along the inguinal canal toward the internal abdominal ring (Fig. 5876).

The exposure and freeing of the round ligament is now accomplished. The margins of the split aponeurosis of the external oblique are retracted – between which boundaries, and forming the floor of the wound, are the following structures – internal oblique muscle, outward – and fatty areolar tissue and generally the ilio-inguinal nerve, inward, lying upon the transversalis muslce. It is in the inner part of this floor – in the fatty areolar tissue, more or less indistinguishable at first, that the round ligament is sought. Its recognition is sometimes easy – often difficult – and is occasionally abandoned. At other times it is only found after lifting up and teasing apart the fatty

areolar tissue which forms the floor of the inner aspect of the wound – and working from the inner aspect of the inguinal canal where the ligament is more frayed out and least recognizable, near the external ring, toward the outer aspect, where it becomes more demonstrable and cord-like in structure, near the internal abdominal ring.

Concerning the recognition of the round ligaments, which constitutes the pivotal point of the operation, as it were, the following bearings of the subject are quoted from McKay: – "Those unfamiliar with the operation imagine that the ligament can be seen at once when the intercolumnar fibers of the aponeurosis are split across. Sometimes it can be seen, as Alexander said in his original description of the operation, 'A reddish tissue now bulges

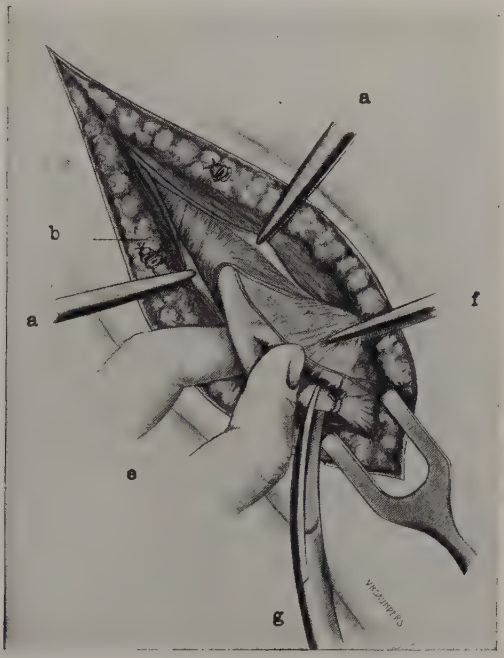


Fig. 5878.—The Same – III: – a, a, Retraction of the split margins of the external oblique; – b, ligated superficial circumflex iliac. The inguinal fatty areolar tissue has been seized with forceps, f, while the ligament is isolated by the fingers, e, in the act of teasing the ligament free of its enmeshment. The ilio-inguinal nerve is seen coursing over the inguinal bed. The round ligament (here probably represented somewhat too large) has been ligated distally – a proximal ligature is supposed to be beneath the thumb – and the ligament is in the act of being divided between them.

out, so characteristic in appearance as to be easily recognized, mixed with a greater or less quantity of fat.' More often, however, the ligament lies buried, surrounded by fat and connective tissue. . . . The operator now seizes *this floor of fat* with a pair of dissecting forceps and raises it; then he twists the forceps so that he turns the *border* (of the fat) *that lies next to Poupart's ligament* up toward him, and he seizes this border between the thumb and index-finger of his left hand, and with his fingers he *turns the fat over so that the under surfaces come into view.* Holding the fat thus turned over, the operator gently teases it with a pair of dissecting forceps, and the ligament comes into view immediately. . . . In looking for the round ligament we should always suppose that it rests *on the inner surface of Poupart's*

ligament, while it is most easily found as it emerges from under the border of the internal oblique."

Some Operators isolate the ligament by first picking up its more distal, frayed-out end (Fig. 5877).

The round ligament, once located, should be kept in view, and its mobilization from the neighboring fatty areolar tissue be immediately proceded with. This is accomplished largely by blunt dissection, aided, here and there, by a knick of the knife or scissors. It is well to divide the ligament about 2 cm. ($\frac{3}{4}$ inch) from its distal end, between double ligatures (as its blood-supply comes from both ends) – after which the proximal end is grasped with clamp forceps, which are of service in the subsequent manipulations (Fig. 5878). The ligament is then best freed by pushing backward, toward the abdominal cavity, with a gauze-covered finger, first the fatty areolar tissue from the more distal portion of the ligament – and, as the cavity is approached, the

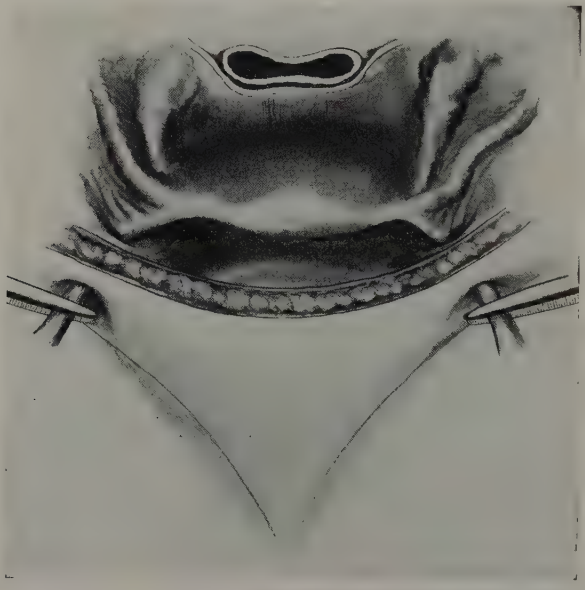


Fig. 5879.—The Same – IV; – The uterus is here represented drawn forward by traction upon the broad ligaments – as though seen from within the abdomen.

sheath of the ligament formed by the infundibuliform process of the fascia transversalis. The aspect of this sheath with which one comes into contact in this backward freeing is not peritoneum – but it is lined with peritoneum, and if the entire thickness of the sheath were here cut through one would come into the peritoneal cavity. The sheath can only be freed from the round ligament for a certain distance, after which further attempts must be abandoned, or the peritoneal cavity opened – which latter, in the operation immediately under consideration, is not done (see the succeeding operation). The second round ligament is similarly exposed.

As the first important step was the recognition and isolation of the round ligament, the next is the determination of the ability to draw the uterus forward by traction upon the round ligaments, and the amount of such forward-bringing of the organ. Both round ligaments are exposed and made ready for shortening before either is shortened and anchored.

A *sufficient* forward drawing out of the round ligaments is necessary to the success of the operation. About 10 cm. (4 inches) suffices in those who have not borne children – and from 10 to 12.5 cm. (4 to 5 inches) in those who have. In the married the ligaments are deliverable ("run" through the abdominal structures and wound) more readily than they are in the unmarried, in whom, also, they are more apt to break (as well, also, as in the aged).

The test as to whether the uterus has been drawn sufficiently forward, as given by McKay, is that the Surgeon should be able to feel the fundus of the

Fig. 5880.—The Same – V; – The stump of the round ligament is being anchored in the inguinal canal by sutures which pass through the retracted margin of the internal oblique muscle, the entire substance of the round ligament, and the shelving border of the external oblique muscle, at some distance within its cut edge. The excess of length of the round ligament is being excised, after the calculation of the amount needed in anchorage has been made: – a, a, Tractors of the margins of the split external oblique; – b, tractor of the border of the internal oblique; – c, such an opening into the peritoneum as is made in the Alexander-Adams-McKay operation is here shown sutured, but is not a part of the present technic (v. p. 515); – d, special suture anchoring the round ligament to the structures of the inguinal canal at the internal abdominal ring; – e, interrupted sutures anchoring the stump of the round ligament in the inguinal canal between the free border of the internal oblique and the shelving portion of the external oblique; – f, excising the excess of round ligament stump; – g, ligated distal end of the ligament.

uterus moving from side to side through the abdominal wall toward the right, when the right round ligament is further tensed, and, alternately, toward the left, when the left ligament is drawn upon (Fig. 5879).

If the round ligaments cease to "play out," or "run," as they are being drawn upon, the epxlanation may be twofold: – The uterus may be held by adhesions (which, though, should have been previously surmised and accepted as a contraindication to operation) – or, which is more likely in the cases which have gone so far as to reach this stage of the operation, the round ligament may be held in the inguinal canal by some muscle-fibers corre-

sponding with the bundles of the cremaster muscle in the male, and which bind it to the canal – and which may be freed by the careful use of a narrow-bladed knife or by scissors (the ligament, when held by this cause, then running freely).

If the non-running of the round ligaments be due to uterine adhesions or other intrapelvic conditions, the operation, as far as the simple type of the Alexander procedure is concerned, is abandoned – and the wound closed. If it be decided to open the abdominal cavity, the operation then becomes the one to be next described (v. p. 515) – and the same is the case if the opening of the peritoneal cavity were a predetermined part of the technic to be followed, independently of encountering complications which made either its adoption or the abandonment of the operation necessary.

Fig. 5881.—The Same – VI; – Closing the wound by the overlapping method: – **a, a,** Buried chromic catgut sutures drawing the free upper margin of the split external oblique into contact with the under surface of the lower aspect of the split external oblique, at some distance from its free edge; – **b,** sutures uniting the overlapping free margin of the lower aspect of the split external oblique to the outer surface of the upper aspect of the split external oblique. The fascia may be brought together, if a thick layer be present, by separate buried sutures – after which the margins of the skin will be united by silkworm sutures.

In those cases in which the uterus is readily brought forward by simultaneous traction upon the two exposed, isolated, ligated, and divided round ligaments, the anchorage of the divided and shortened round ligaments in the inguinal wounds is the next consideration. The excess of round ligament is excised – the distal end being sacrificed, and the free end again ligated with catgut – or it may be better to leave the excision and ligation until after the anchorage. Various methods of anchorage have been employed. A good method is to let the interrupted No. 2 chromic catgut sutures be passed through the internal oblique muscle – then traverse the round ligament – and, lastly, pass through the shelving border of Poupart's ligaments, a short distance within the free border of the incised external oblique aponeurosis, as in the hernia

operation (Fig. 5880). The surfaces and margins of the split aponeurosis of the external oblique are then united by the ordinary overlapping technic employed in hernia operations (Fig. 5881). It may be indicated to approximate the connective tissues overlying the external oblique with a few buried catgut stitches. Finally the skin is closed with silkworm filament.

The patient is usually kept in bed for about two weeks.

Comments.—Before beginning the operation it is well to place the uterus into as normal a position as possible by bimanual manipulation, and retain it there by a packing placed in the anterior fornix. And, if necessary, at the time that the uterus is being finally drawn into a forward position by traction upon the stumps of the round ligaments, this portion of the technic may be aided by two fingers of an Assistant introduced first into the posterior fornix of the vagina, whereby the fundus uteri may be elevated into position – and then into the anterior fornix, whereby the cervix may be pushed backward, and, at the same time, the entire uterus elevated. By these combined manipulations a better approximation of the uterus to the anterior abdominal wall can be made than by depending entirely upon the tensile strength of the round ligaments to mechanically draw it forward, as one checks up a horse. The danger of breakage of one or both of the round ligaments is thereby lessened.

If one round ligament breaks during the simultaneous traction upon both ligaments, the operation may be proceeded with, as the satisfactory anchorage of a single ligament has served to hold the uterus in a forward position. But if both round ligaments break inside of the internal abdominal ring, this special form of operation must be abandoned.

The best position for recognizing the round ligament is at the point where it comes out from under the border of the internal oblique muscle – the fatty areolar tissue of the inguinal canal is here picked up with forceps, *en masse*, but McKay stresses the point that even then the round ligament must not be sought or any attempt made to tease the constituent tissues apart *until after the mass of tissues thus picked up has been turned over.*

It is to be remembered that failure to draw the uterus forward by traction upon the round ligaments is almost invariably due to either anchorage of the round ligaments by muscle-fibers corresponding with the cremaster strands (to be relieved by snipping) – or to intrapelvic adhesions.

If the uterus be markedly retroflexed, traction upon the round ligaments may actually increase the retroflexion (further doubling the posterior wall of the fundus upon the posterior wall of the fundo-cervical junction) – owing to the attachment of the round ligaments, in such cases, lying above the fundus (in its abnormal position – that is, nearer the cervix) – so that the pull of the ligaments is actually at a disadvantage.

For considerations concerning the selection of operation for retrodisplacement of the uterus, see Operations for Retrodisplacement of the Uterus, in General, (v. Index).

OPERATION FOR RETRODISPLACEMENT OF THE UTERUS BY EXTRAPERITONEALLY SHORTENING THE ROUND LIGAMENTS, AFTER EXPOSING THE PERITONEAL CAVITY THROUGH THE INGUINAL ROUTES

ALEXANDER-ADAMS-GOLDSPOHN-MCKAY TECHNIC

Description.—The essentially technical part of the operation, as far as the correction of the backward displacement is concerned, is precisely the same as the simple Alexander operation just described (v. p. 508). That is, the operation begins and ends as it does. The characteristic feature of the present procedure, however, is that the peritoneal cavity is entered – both for the purpose of examining the status of the pelvic structures, and for simul-

taneously correcting these in so far as is possible – especially in the direction of breaking down adhesions of the uterus which would otherwise interfere with the ultimate success of the simple Alexander operation. This opening of the peritoneum upon both sides is limited to the extent of incisions of just sufficient extent as to enable the right and left index-fingers to be introduced into the cavity – the entries being made by incising pouches surrounding the round ligaments, and made up of the infundibuliform process of the transversalis fascia upon its outer aspect, and the peritoneum upon its inner.

The operation may be originally undertaken with the intention of opening the abdomen for the general purpose of examination – or this feature of the operation may not have been planned, and may not be undertaken until, in the course of the simple Alexander operation, failure to bring the uterus for-

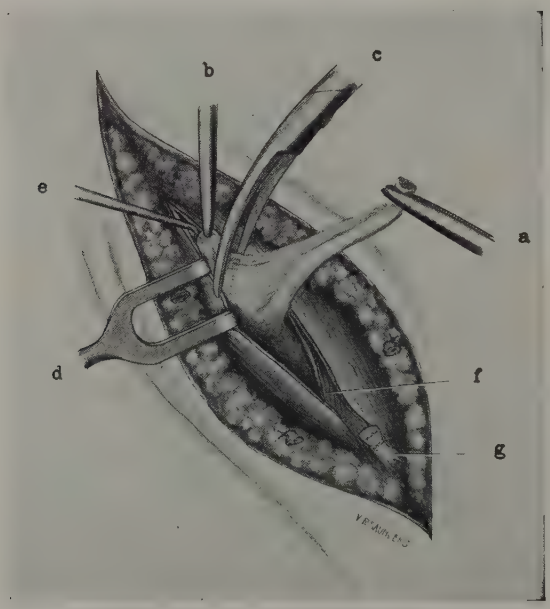


Fig. 5882.—Operation for Retrodisplacement of the Uterus by the Extraperitoneal Shortening of the Round Ligaments, After Exposing the Peritoneal Cavity Through the Inguinal Routes – Alexander-Adams-Goldspohn-McKay Technic – I; – The preceding steps having been carried out as in the simple Alexander operation, the fascioperitoneal pouch surrounding the round ligament, while being tensed, is obliquely incised – thus opening the peritoneal cavity.

ward by traction upon the round ligaments (after being sure that these are not held by muscle-fibers) may indicate the necessity of either abandoning the operation altogether, or of opening the abdomen and ascertaining (and correcting, if possible) the cause of failure.

This addition to the original technic naturally broadens the scope of the present operation – and, indeed, at the time of entering the peritoneal cavity, other technical procedures are sometimes carried out as a result of discoveries then made, other than those originally contemplated in connection with the simple correction of a retrodisplacement. Diseased tubes, ovaries, and appendices have been encountered during these operations, and removed through the incisions originally made in the peritoneum for the examination and correction of uterine defects.

To the advantages mentioned under the simple Alexander operation

must be added the greater scope of the present procedure, both in the field of examination and in that of correction of conditions present.

To the disadvantages there mentioned must be added the counterbalancing seriousness of opening the abdominal cavity. One eminent gynecologic Surgeon, in further criticism of the present technic, writes: "Opening the abdomen through the internal rings to inspect the pelvis is labored and unsurgical." Other Surgeons _ and with these the views of the Author coincide _ hold that not only is no advantage and lessening of mortality obtained by these limited lateral abdominal openings of the peritoneal cavity over the median abdominal section _ but that in the latter a more thorough examination may be made, more extensive corrective operations be planned, and the adoption of probably a better form of operation for the correction of the uterine retrodisplacement itself be carried out.

Preparation _ Position _ Landmarks.—As in the simple Alexander operation (v. p. 508).

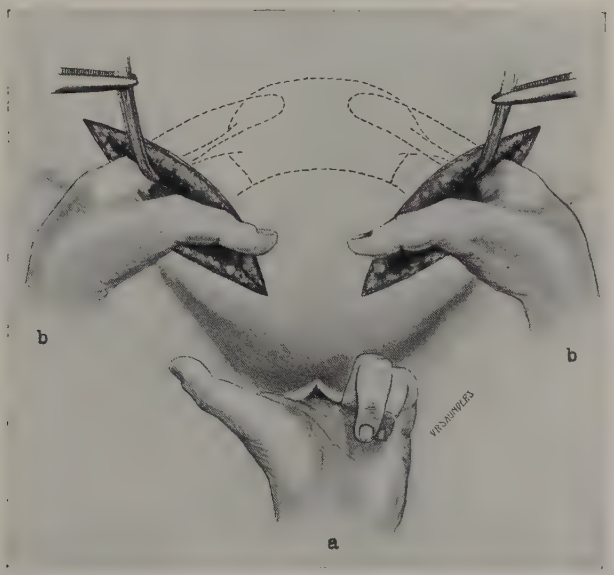


Fig. 5883.—The Same _ II; _ Either breaking up intra-abdominal adhesions or verifying the ability of the freed uterus to be brought forward, _ as accomplished either by an index-finger within both inguinal openings, or by two fingers within the vagina, or by both of these means combined.

Anesthesia _ rather than analgesia.

Incision _ Operation.—Exactly as in the preceding operation _ up to the exposure of the internal abdominal rings. The stump of the divided round ligament is now drawn out at approximately a right angle to the plane of the wound (Fig. 5882). While thus held, the sheath surrounding the round ligament is pushed from the ligament toward the peritoneal cavity by a gauze-covered finger _ and when the limit to which this can be accomplished is reached, this sheath (the outer portion of which is formed of the infundibuliform process of the transversalis fascia, and the lining, by peritoneum) is incised with scissors held at an angle with the axis of the ligament or even transversely to it. If the incision be made too parallel with the ligament, one may pass down alongside of the ligament without entering the peritoneal cavity. If, however, this compound pouch be seized by forceps somewhat

below the site of intended section, while the ligament itself is being tensed, then a ridge can usually be formed which may be readily divided, the section passing directly into the peritoneal cavity (v. **a, b, c,** Fig. 5882). When the cavity is once opened, control of the margins of the peritoneum are secured, automatically, by its adherence to the portion of the fascioperitoneal pouch which has not been cut, but still clings to the round ligament, the opposite aspect of which it still surrounds. The margin of the opening opposite to the one

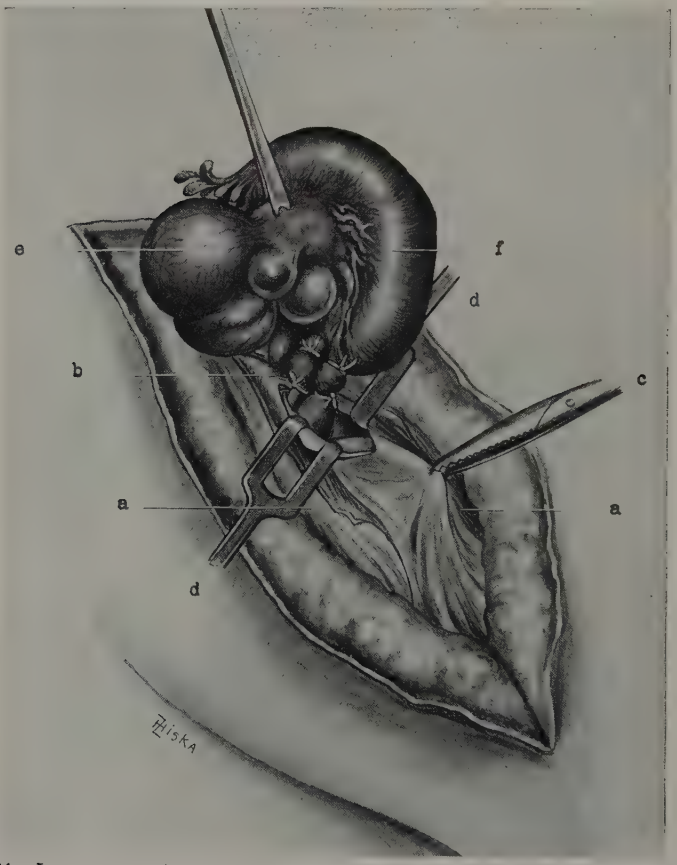


Fig. 5884.—Illustrating Additional Operative Procedures at the Time of Opening the Internal Abdominal Rings to Correct Retrodisplacement of the Uterus; – It will be here seen that a simple condition of hydrosalpinx (non-infective) and a moderate cystic involvement of the ovary have been encountered unexpectedly – and that both structures are in the act of being removed after division between double ligatures: – a, a, External oblique; – d, d, retractors of peritoneal wound; – c, round ligament; – b, internal oblique; – e, cystic ovary; – f, cystic tube.

nearer the round ligament is seized with a fine clamp forceps, so that by drawing ligament and tube apart room is made for the passage of the finger. The most convenient index-finger is then passed along the ligament, and through the internal abdominal ring, into the peritoneal cavity. An examination is made of the body of the uterus, especially posteriorly, where adhesions are apt to be encountered – and, if found, are carefully separated by digital dissection (unless too massive). The tubes and ovaries are similarly examined – and any interfering adhesions broken down. The separation of adhesions may be

materially aided by combined manipulation _ two fingers within the vagina aiding the one within the peritoneal cavity _ further aided, sometimes, by the grip of a vulsellum forceps upon the anterior lip of the cervix. While the introduction of a finger upon one side will suffice for all the freeing indicated to be accomplished, the alternate introduction of the index-fingers is better. As final proof of the freedom of the uterus to come forward, an index-finger of each hand may be introduced through the two lateral openings, and be carried behind the fundus of the uterus, which may then be brought forward against the anterior abdominal wall (Fig. 5883). An Assistant's two fingers within the vagina, at this stage, may further corroborate the non-adherence of the uterus to surroundings, and demonstrate the completeness of the reposition.

The uterus is now drawn up into its intended position by traction upon the ligaments _ about the completeness of the technic in these opened-abdomen cases there remains no doubt. The opening made into the fascioperitoneal pouch is now repaired by fine chromic catgut sutures _ carefully avoiding the penetration of any adjacent coil of intestine. These sutures should pass through one margin of the transversalis fascia and peritoneum _ then through the round ligament _ and finally through the opposite margin of peritoneum and transversalis fascia. Any redundancy of peritoneal opening to either side of the exit of the round ligament should be closed with extra sutures.

Finally the round ligaments are anchored, and the inguinal wound on each side is closed in the same manner as described and pictured in the simple Alexander operation.

Comments.—As has been mentioned, sometimes conditions are encountered, after entering the peritoneal cavity, accompanying the uterine retrodisplacement which are capable of being rectified through one or the other lateral opening _ such, for instance, as simple hydrosalpinx or cystic degeneration of the ovaries of minor grade. In such cases _ and in the absence of septic states from which infection might be diffused, these conditions should be corrected at the time through the already made openings _ as suggested in Fig. 5884.

CHAPTER XCI

INTRA-ABDOMINAL OPERATIONS UPON THE OVARIES, OVARIAN LIGAMENTS, FALLOPIAN TUBES, AND FOR INTRAPELVIC INFECTION

Surgical anatomy of the intraperitoneal female generative organs, p. 520; _ Of the uterus, p. 520; _ Of the broad ligaments, p. 522; _ Of the round ligaments, p. 523; _ Of the ovaries, p. 524; _ Of the fallopian tubes, p. 525.

Surface forms and landmarks, p. 526.

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SURGICAL ANATOMY OF THE INTRAPERITONEAL FEMALE GENERATIVE ORGANS

The Uterus

Description.—Situated in pelvic cavity, between bladder and rectum, supported by its ligament _ its cervix projecting into superior part of vagina, downward and backward _ and its base upward and forward. Communicates with fallopian tubes and vagina. Consists of serous, muscular, and mucous coats. Length, about 7.5 cm. (3 inches) _ breadth, about 5 cm. (2 inches) _ thickness, about 2.5 cm. (1 inch). Its divisions are: fundus, body, cervix, uterine cavity, internal and external os, and openings of fallopian tubes.

Relations of Fundus and Body.—Anteriorly: covered by peritoneum and separated from posterior aspect of bladder by uterovesical peritoneal pouch (generally occupied by coils of intestine). **Posteriorly:** covered by peritoneum and separated from anterior aspect of rectum by recto-uterine pouch of peritoneum (in which are generally some coils of intestines). **Laterally:** broad ligaments; fallopian tubes (above); round ligament (below); ligaments of ovaries (behind). **Superiorly:** covered by peritoneum.

Relations of Cervix Uteri.—(1) Intravaginal Portion; _ surrounded by vagina, which extends higher posteriorly than anteriorly _ and presents opening of os externum. (2) Supravaginal Portion; _ one-half of entire cervix is supravaginal posteriorly and two-thirds anteriorly. Presents opening of internal os The relations of supravaginal portion are the following: _ **Anteriorly:** bladder (areolar tissue intervening). **Posteriorly:** peritoneum of Douglas' pouch. **Laterally:** broad ligament; uterine vessels; ureters (which are about 1.3 cm., or ½ inch, away). (3) Vaginal Portion; zone of vaginal attachment _ oblique _ higher posteriorly than anteriorly.

Relations of Peritoneum.—Invests whole of posterier aspect of uterus, but only upper three-fourths of anterior aspect.

Ligaments.—Three pairs peritoneal – four pairs muscular (three of latter lying between folds of broad ligament and one between folds of posterior ligament). **Two Lateral or Broad Ligaments** (peritoneal): – duplication of peritoneum extending transversely outward from sides of uterus and vagina to sides of pelvis – the two peritoneal layers being continuous above at free border, but diverging below and laterally, and including various structures between their folds (v. Broad Ligament, page 522). **Two Anterior or Vesico-uterine** (peritoneal): – reflected from top of bladder to anterior wall of uterus, at junction of supravaginal cervix. **Two Posterior or Recto-uterine** (peritoneal): – peritoneal folds reflected backward from intraperitoneal part of cervix and vagina, on to second part of rectum – forming lateral boundaries of Douglas' pouch. **Two Uterosacral** (muscular): – muscular bands lying between folds of the posterior or recto-uterine ligaments. Extend from second and third pieces of sacrum forward and downward to sides of uterus at junc-

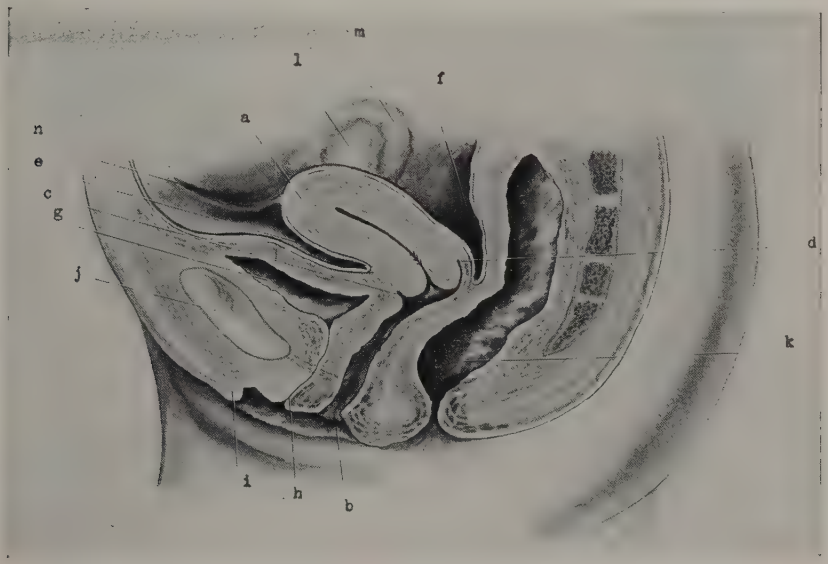


Fig. 5885.—Sagittal Section of the Female Genital Organs: – **a**, Uterus; – **b**, vagina; – **c**, anterior vaginal fornix; – **d**, posterior vaginal fornix; – **e**, vesico-uterine peritoneal pouch; – **f**, recto-uterine peritoneal pouch; – **g**, bladder; – **h**, urethra; – **i**, clitoris; – **j**, symphysis pubis; – **k**, rectum; – **l**, ovary; – **m**, fallopian tube; – **n**, round ligament. (Modified from Deaver.)

tion of body and supravaginal cervix (opposite os internum), crossing the sides of the rectum opposite the junction of its first and second parts. **Two Utero-pelvic Ligaments** (muscular): – muscular expansions, extending between folds of broad ligaments, from fascia over obturator internus muscles to sides of uterus and vagina, surrounding the uterovaginal vessels and nerves. **Two Utero-ovarian Ligaments (Ligaments of the Ovaries)** (muscular): – prolongations of uterine muscular fibers in the form of round cords, extending between folds of broad ligaments, from upper angles of uterus to inner aspects of ovaries. **Two Round or Utero-inguinal Ligaments** (muscular): – fibromuscular cords, 10 to 22.5 cm. (4 to 5 inches) long, placed between folds of broad ligaments, extending from superior angles of uterus through inguinal canals to labia majora (v. Round Ligaments, page 523).

Arteries.—Ovarian, of abdominal aorta – carried into broad ligament by infundibulopelvic ligament – divides into tubal artery and ovarian artery

proper. Uterine of internal iliac _ runs downward along pelvic wall to base of broad ligament _ thence inward near floor of pelvis toward cervix, which it reaches at junction of vagina, passing in front of ureter _ and runs up side of cervix and uterus between folds of broad ligament, communicating with opposite uterine and branches of ovarian.

Veins.—Correspond with arteries. Veins from ovarian plexuses empty _ right, into inferior vena cava _ left, into left renal. Veins from uterine plexuses empty into internal iliac veins.

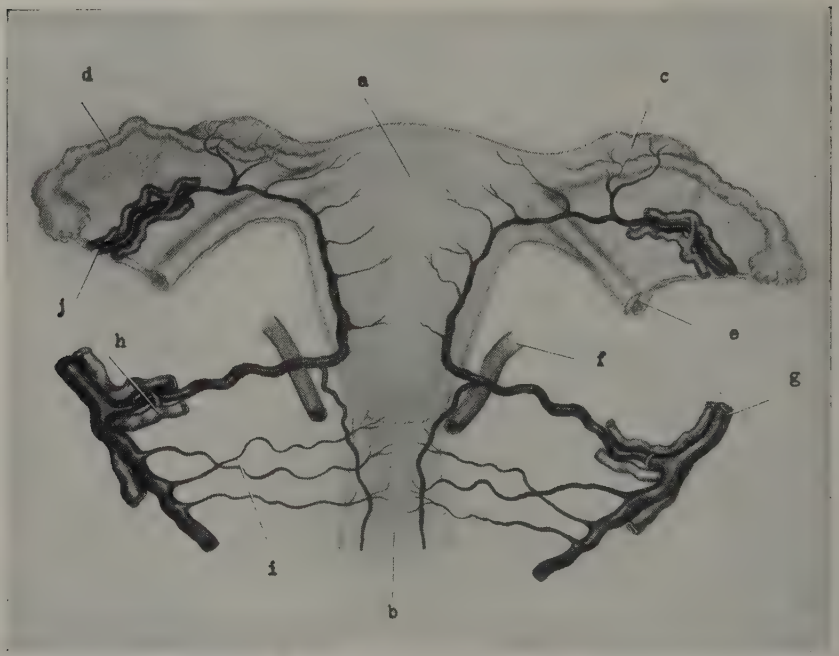


Fig. 5886.—Scheme of Blood-supply of the Female Internal Generative Organs: _ a, Uterus; _ b, vagina; _ c, ovary; _ d, fallopian tube; _ e, round ligament; _ f, ureter; _ g, internal iliac vessels; _ h, uterine vessels; _ i, vaginal arteries; _ j, ovarian vessels.

Lymphatics.—Those from body empty into lumbar glands _ and those from cervix into pelvic glands.

Nerves.—From third and fourth sacral _ and from hypogastric and renal plexuses.

The Broad Ligaments

Description.—Duplicature of peritoneum, extending transversely from sides of uterus and vagina outward to sides of pelvic wall _ the two layers being continuous superiorly at their free border _ and diverging laterally and inferiorly to envelop various structures (v. i.).

Relations.—Superior or Free Border (mesosalpinx): _ summit of duplicature, where it envelops fallopian tube. Extends from side of uterus toward pelvic wall, to beyond the fimbriated extremity of fallopian tube. Infundibulopelvic ligament _ that portion of superior border of broad ligament between fimbriated extremity of fallopian tube and lower attachment of broad ligament _ a concave, rounded border _ the ovarian vessels being conveyed in this ligament. **Inferior Border:** _ attached to levator ani muscle and rectovesical fascia. Ureters, vessels, and nerves pass through the subperitoneal areolar

tissue between its layers. **Internal Border:** – attached to lateral walls of uterus and vagina. Uterovaginal vessels and muscular bands pass between the two laminæ. **External Border:** – in contact with obturator fascia. Transmits uterine vessels and round ligament.

Structures Between Two Layers of Broad Ligament.—Ovary – projects from posterior lamina. Ligament of ovary – from angle of uterus to lower or internal aspect of ovary. Fallopian tube – in upper free margin. Round ligament – forms a ridge beneath anterior lamina, on its way to inguinal canal. Parovarium (fetal relic) – between ovary and outer part fallopian tube. Duct of Gaertner; hydatid of Morgagni; small cysts – all fetal relics. Uterine, ovarian, and funicular vessels; lymphatics, and uterine plexus of nerves. Subperitoneal fatty areolar tissue. Involuntary muscular fibers – from obturator fascia to sides of uterus and vagina.

Broad ligament divides pelvic cavity into: – Anterior part – containing bladder, urethra, and vagina; – Posterior part – containing rectum.

Fig. 5887.—Sagittal Sectional View, Showing the Relations of the Anterior and Posterior Vaginal Fornices – and Uterovesical and Uterorectal Peritoneal Pouches.

Boundaries of Douglas' Recto-uterine Pouch.—Anteriorly: posterior wall of uterus, supravaginal cervix, upper fourth of vagina. Posteriorly: rectum, sacrum. Laterally: sacro-uterine ligaments. Superiorly: small intestines.

The Round Ligaments

Description.—Two flat, cord-like bundles of muscular, fibrous, and areolar tissue, vessels and nerves, continuous with uterine fibers, attached to superior angles of uterus just below and in front of fallopian tube – each passes upward, outward, and forward between layers of broad ligaments to pelvic wall, raising the anterior layer of broad ligament into a fold – curves around deep epigastric artery or inner side of external iliac artery – enters internal abdominal ring – passes through inguinal canal – emerges from external ring – its fibers then becoming lost in tissues of labia majora and mons veneris. May be accompanied by an invagination of peritoneum, the canal of Nuck (analogous to pouch of peritoneum accompanying descent of testes), which may remain patulous. Receives fibers in transit through inguinal canal – and

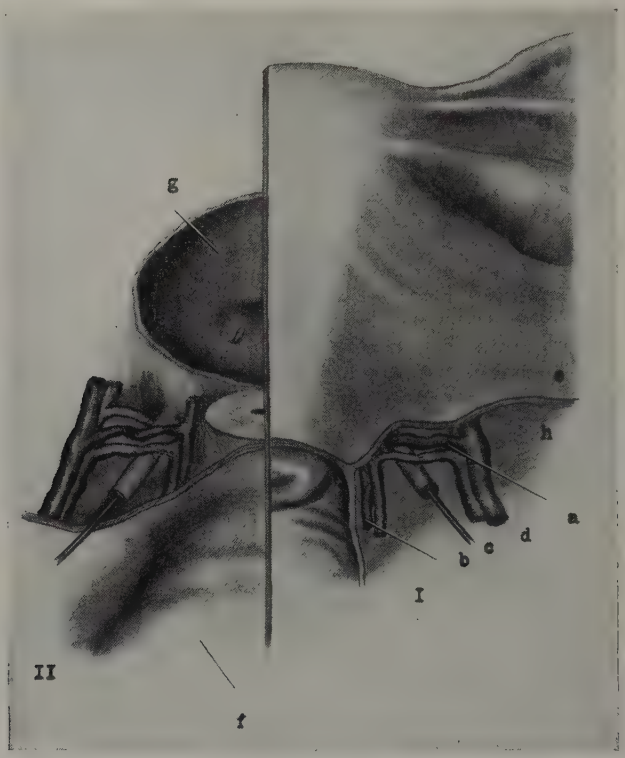


Fig. 5888.—Posterior View of the Uterovaginal Vessels and of the Uterus; – I, Right posterior view of the uterus, adnexa, and broad ligament, the latter being delaminated below, and the posterior wall of the vagina removed, showing the cervix – bringing to view, between the folds of the broad ligament: – d, Internal iliac vessels; – a, uterine vessels; – b, vaginal vessels; – c, ureter, passing beneath the uterine vessels, on its way to the bladder. II, Left peritoneal reflection removed from the uterus and bladder, showing a deeper view of the same structures as seen on the right. A ureteral sound is seen emerging from the vesical opening of the ureter: g, Bladder; – f, rectum; – e, posterior layer of the broad ligament; – h, anterior layer of the broad ligament. The illustration is best understood by first viewing the right side with the left covered – and then the reverse. (Redrawn from various Anatomies.)

gives off few fibers to pillars of ring. Average length – 10 to 12.5 cm. (4–5 inches). Supplied by funicular branch of superior vesical of internal iliac.

The Ovaries

Description.—Placed one on each side of the pelvis – connected with the posterior layer of the broad ligament, posterior and inferior to the fallopian tubes. Rests against the lateral wall of pelvis, with long axis nearly vertical in erect position of body (His). Length, about 3.8 cm. ($1\frac{1}{2}$ inches); – breadth, about 2 cm. ($\frac{3}{4}$ inch); – thickness, about 1.3 cm. ($\frac{1}{2}$ inch). Position of ovary corresponds with a point about 5 cm. (2 inches) internal to the anterior superior iliac spine. In the position and relations given by His, the fallopian tube and fimbria almost completely envelop the ovary. In structure the ovary consists of peritoneal serous covering and stroma.

Relations.—Mesial Surface: – Is free. Fimbriated extremity of fallopian tube is in contract to various extent. Mesosalpinx is also in relation. Coils of jejunum and ileum often to inner side of right ovary. Sigmoid colon may be to inner side of left ovary. **Lateral Surface:** – Lies in fossa ovarii, a peritoneal depression upon the lateral pelvic wall, generally just below the

external iliac vessels _ with the ureter often bounding the fossa below and behind. **Posterior Border:** _ Is free. Directed toward rectum. Partly embraced by fimbriated end of fallopian tube. **Anterior Border:** _ Furnishes attachment to broad ligament. Presents hilum (between two layers of broad ligament) for entrance of vessels and nerves. Fallopian tube. **Upper Extremity:** _ Ovarian fimbria of fallopian tube are attached. Ligamentum suspensorium ovarii (ligamentum infundibulopelvicum) passes from brim of pelvis to upper extremity _ conveying the ovarian vessels and nerves. **Lower Extremity:** _ Ligament of ovary _ from angle of uterus to lower or inner end of ovary.

Arteries.—Ovarian of abdominal aorta; anastomotic branches of uterine and internal iliac. The ovarian artery, crossing brim of pelvis, enters broad ligament and runs in fundibulopelvic ligament _ and, passing between layers of broad ligament, runs to the ovary and upper part of uterus.

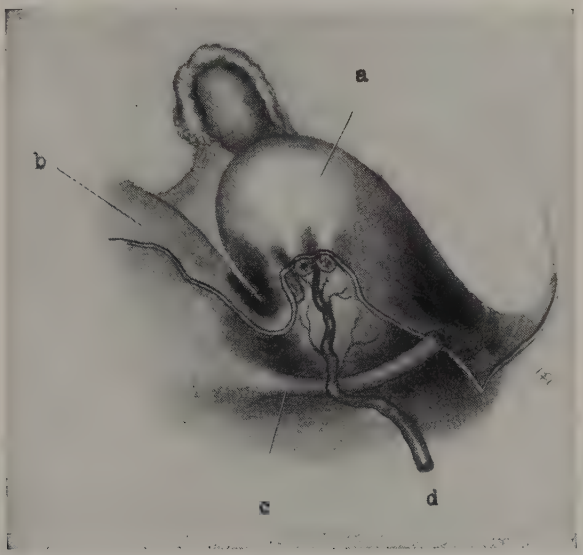


Fig. 5889.—Lateral View of Uterus and Bladder, with Relation of Ureter and Uterine Artery: _ a, Uterus; _ b, bladder; _ c, ureter; _ d, uterine artery crossing over the ureter and passing upward and inward to the uterus. (Redrawn from various Anatomies.)

Veins.—Follow the arteries _ and form the pampiniform plexus.

Nerves.—From ovarian plexus; from pelvic plexus; from uterine nerves.

Lymphatics.—Empty into prevertebral glands in front of aorta and vena cava.

The Fallopian Tubes

Description.—Average length, 10 to 12.5 cm. (4–5 inches). Begin at superior angle of uterus and extend _ enclosed in upper free border of the broad ligament _ to the sides of the pelvis, ending in the fimbriated extremities, which are in relation with the corresponding ovaries. After enveloping the fallopian tubes, the layers of the broad ligament are continued down to the ovary. The tubes are made up of _ the isthmus (inner third) _ ampulla (from isthmus to neck) _ neck (or ostium abdominale) _ and fimbriated extremity. They are composed of serous, muscular, and mucous coats.

Course and Relations.—From the superior angles of the uterus they run nearly horizontally outward for about 1.3 to 2.5 cm. ($\frac{1}{2}$–1 inch) to the pelvic

wall – thence ascend, sometimes tortuously, anteriorly to their ovaries – then curve backward over the ovaries, lying internal to the suspensory ligament – and end by passing downward along the inner and posterior borders of the ovaries. Ileojejunal convolutions are sometimes above and to inner

Fig. 5890.—Pelvic Floor – Seen from Within: – a, Symphysis pubis; – b, meatus urinarius; – c, vagina; – d, rectum; – e, sphincter ani; – f, coccyx; – g, "white line"; – h, sacrum; – k, coccygeus; – l, pyriformis; – m, psoas magnus; – i, spine; – j, levator ani. (Redrawn from Kelly and from Deaver and from Anatomies.)

side of right fallopian tube. Sigmoid rectum is sometimes in the same relation to the left tube.

Artery.—Tubal branch of ovarian.

SURFACE FORMS AND LANDMARKS

Uterovesical fold of peritoneum is about on a level with the internal os uteri.

Uterorectal fold of peritoneum is reflected for nearly 2.5 cm. (1 inch) on the posterior wall of the vagina.

The cervix may be divided into three zones: – the lower third is intravaginal; – middle third is, anteriorly, supravaginal (united to base of bladder) – and intravaginal posteriorly; – upper third is supravaginal – united to bladder anteriorly – and in relation with peritoneum posteriorly.

The ureters, in the case of a normal uterus, with empty bladder, lie nearly 1.3 cm. ($\frac{1}{2}$ inch) from the cervix. They pass parallel with the cervix and nearly 1.3 cm. ($\frac{1}{2}$ inch) away – running through the plexus of uterine veins and underneath the broad ligament – and, continuing near the vagina, run between the vagina and bladder, and enter the bladder about on a level with the center of the anterior wall of the vagina. The uterine arteries run over them, upon their inner aspect. For further description of the female ureter, see Index. For the course of the uterine and ovarian arteries see page 521 (also see Fig. 5886, H, J).

INTRA-ABDOMINAL OPERATIONS UPON THE FEMALE GENERATIVE ORGANS, IN GENERAL

As the various forms of abdominal section have been described and illustrated at length under Operations Upon the Abdominal Wall (v. Vol. IV,

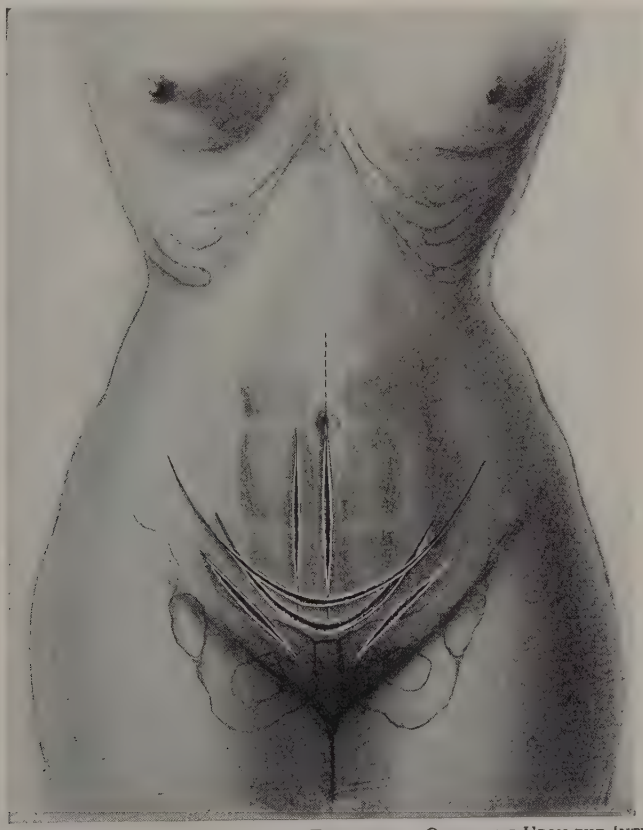


Fig. 5891.—Incisions of Approach Usually Employed in Operating Upon the Intra-abdominal Female Genital Organs; – Infra-umbilical median abdominal section, the most frequent incision in gynecologic surgery, is seen open – the supra-umbilical continuation of this (when needed) is seen dotted. Lenander's paramedian abdominal section – is shown through the skin and fascia of the right rectus, the median border of which will be drawn lateralward (not to injure nerves). Pfannenstiel's incision, the lower curved one (here shown somewhat too curved) – the skin and fascia being incised in this line and retracted upward, while the recti are split in the median line and retracted outward. Bardenheuer's incision – the upper curved one – of larger scope, and the steps following which may be carried out as in the preceding, or, in extreme cases, all the tissues of the abdominal wall may be cut through along the same curved line. The incisions for Alexander's operation, below and to the sides, are represented extending a little too far over the symphysis.

pp. 91-137), the separate consideration of the methods of entering the cavity will not be considered here.

All operations upon the intra-abdominal female organs in this and the following chapters will begin with the special technic in hand, commencing after the peritoneal cavity has been exposed.

The best incision and method of making the abdominal section being merely indicated _ leaving the description of this preliminary step of the procedure, common to all of the operations in Chapters XCI and XCII, to be found where they are given in detail.

The incisions usually employed are shown in Fig. 5891 _ and explained in Vol. IV, pp. 91-137.

A summary of the anatomy of the various intra-abdominal female organs will be found at the beginning of the present chapter.

OÖPHOROPEXY FOR PROLAPSED OVARY

Description.—The ovary is sometimes prolapsed into the recto-uterine culdesac _ either independently of retrodisplacement of the uterus, or as a

Fig. 5892.—Oöphoropexy for Prolapsed Ovary by Zig-zag Shortening of the Ovarian Ligament _ Bonney; _ A suture is passed, from side to side, through the right utero-ovarian ligament of the prolapsed ovary, in such a way as, when tied, to pleat up the excess of ligament. On the left the suture is tied, drawing up the ovary into a higher position. This constitutes the Bonney technic _ in addition to which the left ovary is shown also anchored to the broad ligament in its new position.

part of that displacement _ the position of the ovary, in the latter instance, being then exaggerated. The condition is apt to be accompanied by abnormal phenomena, especially when marked _ and various procedures have been devised to bring the ovary into a more normal position and hold it there.

Oöphoropexy by Simple Shortening of the Ovarian Ligament _ Imlach.—One or two axially placed sutures are carried into the substance of the ligament _ planned in the manner shown in Fig. 5892 (the left ovarian ligament) _ and of such length as to accomplish the required shortening. It will be seen that the stitches make provision for the bending of the ligament

opposite the portion which it bridges _ and to approximate, when tied, a part of the proximal and distal aspects of the ligament _ the serous-covered limbs of the ligament adhering in consequence _ and thereby shortening its length, and drawing the ovary upward, in consequence.

Oöphoropexy by Zig-zag Shortening of the Ovarian Ligament _ Bonney.—A series of in-and-out loops of suturing is accomplished by carrying a single suture back and forth through the lateral aspects of the ovarian ligament in the manner shown in Fig. 5892, right side. When the ends of this suture are drawn together and tied the loops disappear, and the ovarian ligament is segmentally applied to itself as the sides of the loops come into contact, and are held by the knotting of the suture _ as shown on the opposite side of the same illustration (where the independent anchorage of the ovary forms no part of the simple Bonney technic).

Oöphoropexy by Zig-zag Shortening of the Ovarian Ligament Combined with Anchorage of the Ovary to the Broad Ligament.—In addition to carrying out the preceding technic, and after that has been accomplished, the ovary itself is sutured by its margins to some higher position upon the broad ligament than that from which it was lifted (v. Fig. 5892, left ovary).

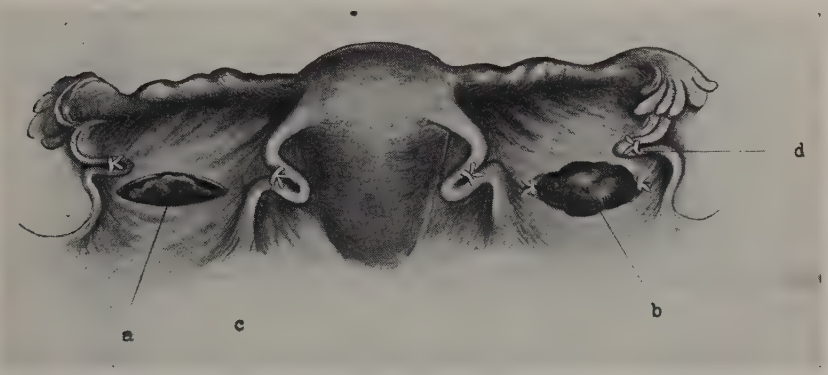


Fig. 5893.—Oöphoropexy for Prolapsed Ovary by Its Transposition Through the Incised Broad Ligament, and Its Anchorage Upon a Higher Level of the Anterior Aspect of the Ligament (Mauclaire) _ Combined with Shortening of the Round and Infundibulopelvic Ligaments for Retrodisplaced Uterus (Barrows) _ as explained in the text.

Oöphorectomy by Twofold Doubling and Suturing of the Ovarian Ligament Upon Itself.—This accomplishes, in effect, the same result as the zig-zag suture _ by a somewhat different method of approximating and suturing the parts of the ligament into contact (v. Fig. 5893, **c**).

Oöphoropexy by Transposition of the Ovary Through the Incised Broad Ligament and Its Anchorage Upon the Anterior Aspect of the Ligament _ Mauclaire.—The downwardly displaced ovary is lifted out of the recto-uterine fossa and elevated to its normal height _ after which a transverse incision is made through the entire thickness of the broad ligament at this level, and through a non-vascular portion of the structure. The prolapsed ovary is then carried through this opening from the posterior to the anterior aspect of the broad ligament (Fig. 5893, **a**) _ and is anchored upon the anterior aspect of the broad ligament as near the fimbriated extremity of the fallopian tube as possible _ the anchorage being accomplished both by lessening the length of the incision in the broad ligament at both ends and by suturing the periphery of the poles of the ovary to the adjacent broad ligament (v. Fig. 5893, **b**).

Oöphoropexy for Prolapse of the Ovary _ Combined with Shortening of the Round and Infundibulopelvic Ligaments for Retrodisplacement of the Uterus _ Mauclaire-Barrows' Operations.—The features of the Mauclaire operation for oöphoropexy are carried out as just described (v. Fig. 5893, **a** and **b**) _ after which the uterus is brought forward by doubling the round ligaments upon themselves and suturing them together (v. Fig. 5893, **c**) _ and then similarly doubling the excess of the infundibulopelvic ligaments upon themselves and suturing them together (v. Fig. 5893, **d**).

PUNCTURE, INCISION, AND EXCISION OF SMALL OVARIAN CYSTS, WITH PRESERVATION OF THE OVARY

These small tumors are usually distention cysts of follicular origin (following the rupture of graafian follicles) _ occurring without clinical symptoms _ and generally discovered by accident in the course of some operation.

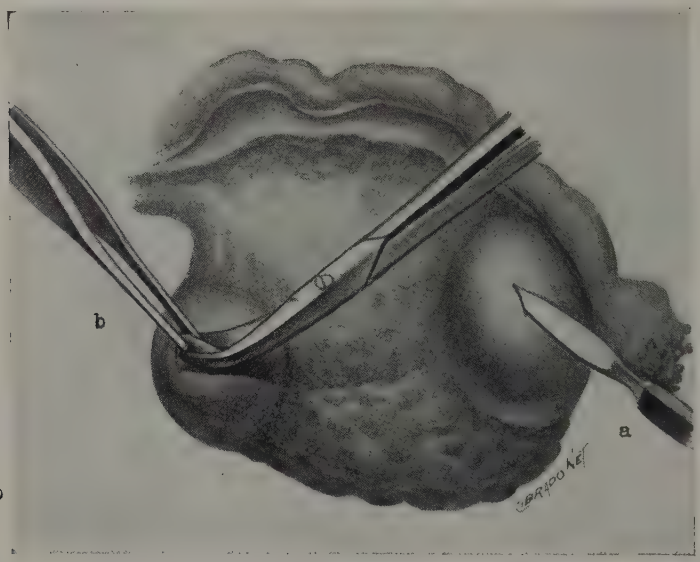


Fig. 5893, *a*.—Conservative Operations Upon Small Cysts of the Ovaries: _ **a**, By incision; _ **b**, by excising a small part of its wall, to prevent its refilling.

Excision of cysts is always preferable to the sacrificing excision of the ovary itself.

Puncture.—Sometimes a considerable number is present, dotting the surface of the ovary _ too many and too conglomerate for excision without sacrificing the ovary _ and these may be conveniently emptied of their fluid contents by needle puncture _ using a Hagedorn needle, with its oblique cutting end that leaves a distinct opening _ and making single or multiple punctures or stabs, increasing the opening on withdrawal _ and then compressing the ovary with gauze to squeeze out the contents of the cysts. This is routine practice _ although refilling probably occurs in a considerable proportion of the tiny cyst cavities.

Incision.—This is an intermediate grade of procedure between puncture and excision of the tumor _ sometimes applicable to very slightly larger (but still small) cysts than those to which puncture is applied. The walls of the compressed and collapsed cyst are then allowed to fall together as they will

(or, better, a small section of the wall is excised, so that reunion cannot occur) – no hemorrhage taking place from these thin incised walls. This procedure is carried out with a thin, narrow-bladed knife (Fig. 5893, *a*) – though the cyst wall is sometimes grasped with forceps and snipped with scissors – the fluid contents being caught upon gauze.

Excision Followed by Suturing.—This procedure approaches somewhat nearer to that of a minor operation. It is applicable to a somewhat larger type of cyst. A single cyst may be included in the excision – or several immediately adjacent and smaller ones. The ovary is brought into the field and steadied by one or by two non-traumatizing clamps – one upon the suspensory ligament of the ovary, and the other upon the mesosalpinx. One of two methods of procedure is generally carried out.

Enucleation of the cyst is, of course, ideal when accomplishable. The capsule of the cyst is surrounded by an incision immediately outlying its

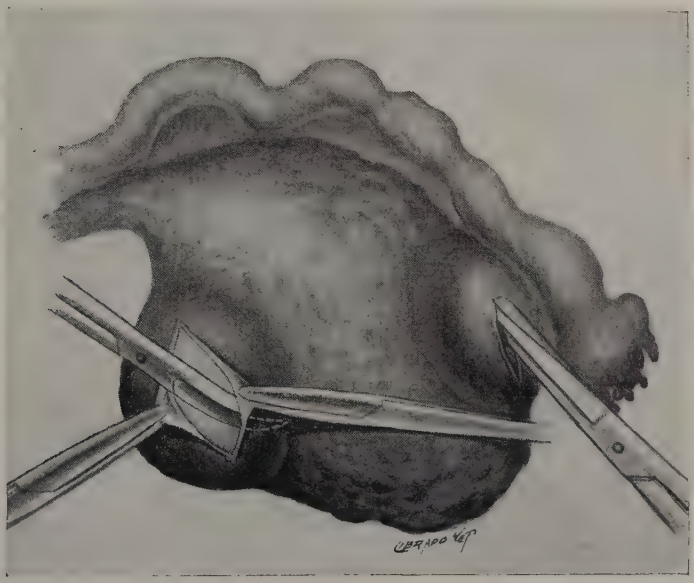


Fig. 5894.—Enucleation of a Small Cyst of the Ovary.

wall, after which the unopened cyst is shelled from its bed by blunt dissection – or its wall is carefully caught with forceps and it is dissected from its bed (Fig. 5894). A small amount of bleeding is apt to occur from the ovarian tissue, and any small bleeding vessel detected is tied with fine catgut – although the bleeding is usually controlled by the sutures which unite the margins, when nothing but a slight ooze can be discovered. The clamps employed should be relaxed before closing the bed of the tumor to make sure that they are not compressing some small vessel which will continue to bleed.

Excision of the cyst, along with limited adjacent ovarian tissue, is the technic most frequently employed – and is usually more feasible than enucleation. Sometimes the excised area, which is elliptic in outline, will include either a single cyst or more than one. The wedge-shaped piece of tumor-and-ovarian tissue excised should be calculated so as to sacrifice the minimum of active ovarian tissue, and also be planned so that the resulting walls will come well together (Fig. 5895). The bed following such an excision is seen

in Fig. 5896 _ and the sutured wound in Fig. 5897. The sutures are of fine catgut, and are carefully placed, as they are apt to tear through the friable ovarian tissue. Bleeding is also more apt to occur from the bed of an excised

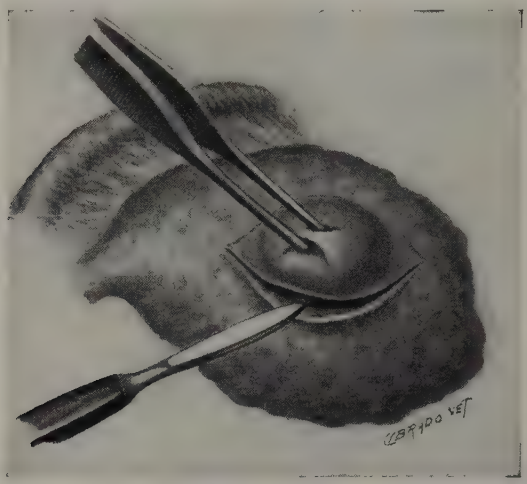


Fig. 5895.—Excision of Small Ovarian Cysts _ I; _ Making the elliptic incision, the outline of which will surround the cyst, or cysts, and the walls of which will meet, wedge-fashion, beneath the mass.

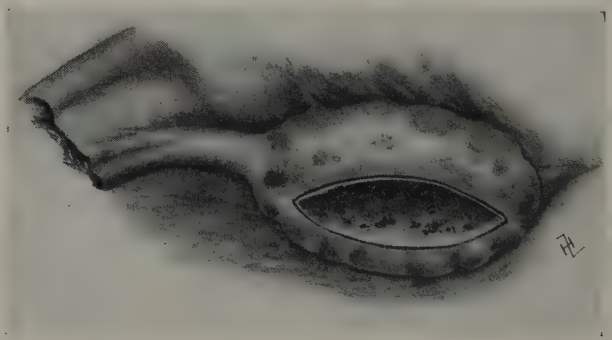


Fig. 5896.—The Same _ II; _ The ovarian bed left after the excision of the cyst.

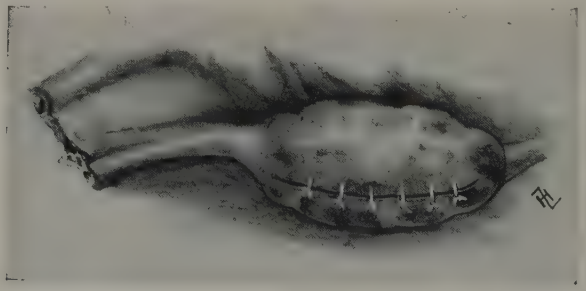


Fig. 5897.—The Same _ III; _ The sutured ovarian wound.

ovarian cyst than from that of an enucleated one _ and must be controlled by fine ligature, gauze pressure, or by the sutures which approximate the opposite walls and margins.

SEPARATION OF ADHESIONS BETWEEN THE OVARY AND THE FALLOPIAN TUBE

Adhesions are often encountered between these structures in the course of operation – and, apart from the desirability of separating adhesions, in general, separation may be especially indicated in order to enable the fimbriated extremity of the fallopian tube to grasp the ovary during the ovarian nisus.

Such adhesions may be simple and easily removed – or dense and difficult to remove. They should be broken down, if possible, by blunt dissection. The preferable method would be a gauze-covered finger. If this do not succeed, a blunt dissector would be the next choice – used in the manner shown in Fig. 5898. If separation be unaccomplishable by these means, curved scissors, blunt or sharp, should be employed – while the structures are being drawn away from each other by forceps.

The difficulty of preventing the re-establishment of adhesions between the raw and non-peritoneally covered surfaces which have been separated – either again between themselves, or with adjacent structures, may be difficult. If it seem likely that readhesion is inevitable, then anchorage of one or the other

Fig. 5898.—Separation of Adhesions Between the Ovary and Uterine Tube – by blunt dissector.

structure, or both, in the best relationship to each other and to adjacent structures by means of a few catgut stitches – in a way so as to make adhesions least likely to recur, or, if they do, to the minimum degree and in the best position – is probably the best policy.

OÖPHORECTOMY OF A SOLID, DISEASED OVARY

Description.—Oöphorectomy (as abdominal or vaginal oöphorectomy) signifies the excision of the ovary – and nothing more. Ovariectomy has the same meaning, and would not be a bad term, but for the combination of Latin and Greek (instead of being throughout one or the other, as in the former expression).

Ovariotomy can only mean derivatively (and synonomously with all corresponding terminology) incision of the ovary – a cutting into the ovary, and only this – with no possible significance as to its removal – and yet it is in its equivalence to the latter that it is ordinarily used. (Upon this analogy one would have to say that gastrotomy meant excision of the stomach instead of incision of the stomach – whereas, the only term which covers excision or removal of the stomach, in whole or in part, is gastrectomy.)

The confused status upon this score may be appreciated by reading the definitions of an unusually prominent gynecologic Surgeon: – "Ovariotomy signifies the removal, through an abdominal incision, of cystic and solid tumors of the ovary and parovarian cysts." And – "Oöphorectomy signifies the removal through an abdominal incision of an ovary and fallopian tube for affections mainly inflammatory."

Evidently ovariotomy and oöphorotomy are the same, and mean simply incision of the ovary – and ovariectomy and oöphorectomy the same, meaning excision of the ovary.

The conditions for which the ovary is removed as here meant to be covered are those in which visibly and palpably demonstrable lesions are found on exposing the structure – and of such degree as to be convincing proof of the impracticability of preserving at least a portion of the organ – and not for those conditions in which conjecture without structural change may theoretically suggest the implication of the ovary as the seat or origin of a series of phenomena manifesting themselves in various nervous directions.

It is pitiable to recall the countless ovaries and appendices often needlessly – and also probably as far as ovaries are concerned, often blameworthily and harmfully – removed entirely unjustifiably and on totally insufficient ground

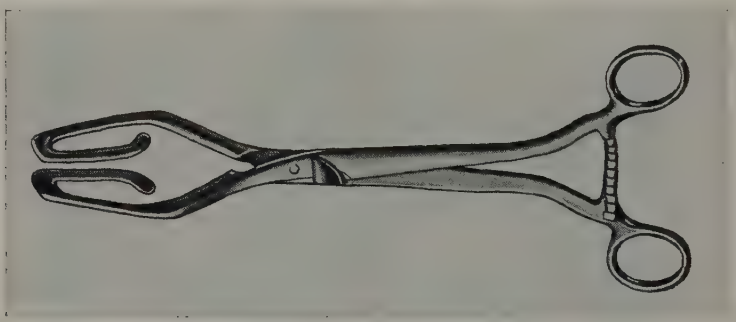


Fig. 5899.—Dartigue's Uterus-holding Forceps.

– and sometimes followed by worse phenomena than those antedating the operation.

The solid tumors of the ovary for which the organ is most frequently removed are – carcinomata and sarcomata, among the malignant – and fibromata, myomata, fibromyomata, teratomata and fibro-adenomata, among the innocent.

Operation.—The patient is conveniently placed in the Trendelenburg position before opening the abdomen by a low median, infra-umbilical abdominal section. The wound margins are laterally retracted – the intestines are packed off toward the diaphragm – and the ovary is sought by first locating the fundus uteri, then passing the fingers downward over its posterior aspect, and, finally, outward over the upper dorsal surface of the broad ligament of the involved side – or the infundibulopelvic ligament can be traced inward until the ovary is encountered – after which the located ovary and its broad ligament bed, together with the tube, are brought into the abdominal wound sufficiently for manipulation. Sometimes the maneuvers to this end are aided by grasping the fundus of the uterus with some type of uterus-holding forceps, such as those shown in Figs. 5899 and 5900. The site of operation, however, is conveniently manipulated by lightly clamping the border of the mesosalpinx on one side and the ovarian suspensory ligament on the other.

The blood-supply of the immediate field is controlled by digital or lightly applied clamp pressure of the ovarian ligament, the infundibulopelvic ligament, and of the ovarian artery or prominent branches. An encircling incision is then made about the ovary, usually of an elliptic outline, so planned

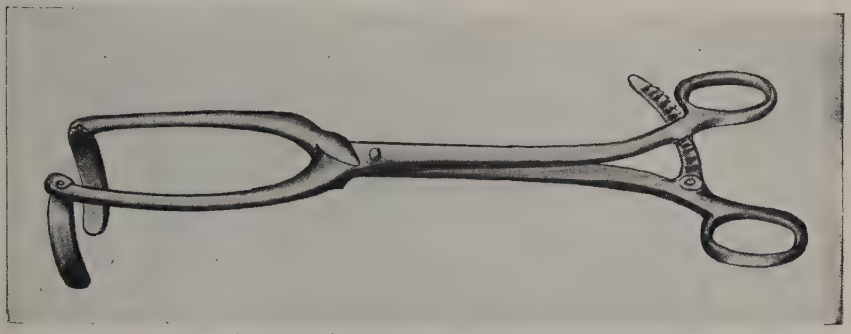


Fig. 5900.—Collin's Uterus-holding Forceps.

that its margins will come readily together (Fig. 5901). This incision is carried through the posterior layer of the broad ligament _ and the ovary is dissected from its connective-tissue bed. The blood-vessels of the two poles of the ovary may be controlled in advance by ligatures carried through the

Fig. 5901.—Oöphorectomy of a Solid, Diseased Ovary _ I; _ The inner pole of the ovary is, here, shown ligated in advance. The circumscribing elliptic incision is dotted. It is rather better to temporarily control bleeding, then excise the ovary, and finally tie the vessels.

tissues of the inner and outer poles, as well as beneath any isolated branches of the uterine artery coursing through the broad ligament into the ovarian structure and anastomosing with the ovarian vessels. Or the ovary may be entirely excised under digital and clamp control, and then the individual vessels be caught and tied _ a somewhat more surgical procedure. The

bleeding bed of the ovary in either technic is brought together by a few buried fine chromic catgut sutures (Fig. 5902). The margins of the broad ligament surface, adjacent to the bed from which the ovary was excised, are sutured together with catgut. Finally, all blood is sponged away, gauze pads removed, and the abdomen closed.

Comments.—The removal of a solid ovary of practically normal or but slightly enlarged size represents a minor surgical feat as compared with the

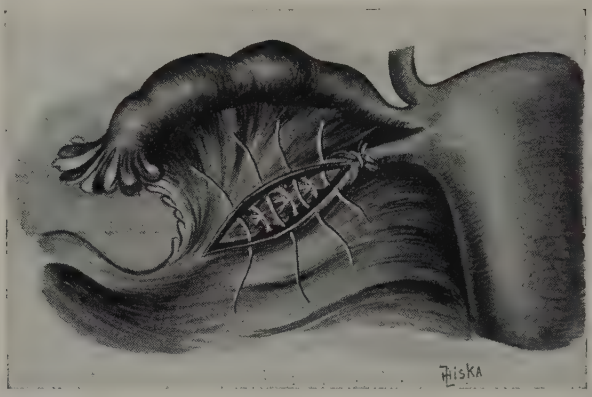


Fig. 5902.—The Same – II; – The bed of the excised ovary has been brought together by buried sutures – and the margins of the posterior surface of the broad ligament are being sutured together.

excision of a very much enlarged ovary, cystic or solid, complicated by dense adhesions to important structures – and whose removal may tax the Surgeon severely.

REMOVAL OF LARGE OVARIAN CYSTIC TUMORS BY THE ABDOMINAL ROUTE

Varieties of Cystic Tumors of the Ovaries.—These, according to the classification of Williamson and Barris, are the following: – (*a*) Those having origin from the graafian follicles are, – distention cysts (hydrops follicularis) – and lutein cysts; – (*b*) Those having origin from down-grown surface epithelium, from cell-rests, or from vestigial remains are, – simple proliferative serous cysts – pseudomucinous cystadenomata – serous cystadenomata – and papillomatous tumors; – (*c*) Tubo-ovarian cysts; – (*d*) Broad-ligament cysts, – fimbrial cysts – parovarian cysts – cysts of the morgagnian hydatids – and hydrosalpinx of an accessory fallopian tube.

The most frequently encountered form of cystic ovarian tumor – or of ovarian tumor in general – is the pseudomucinous cystadenoma – which is innocent in nature – and is generally pedunculated – though it sometimes grows in between the two layers of the broad ligament.

These tumors have been known to reach 166 pounds in weight. They usually contain loculi, often more or less broken down into intercommunicating cavities – or into a single cavity – and are supplied by large vessels. The chief difficulties experienced in their removal occur in connection with the adhesions, often very extensive and dense, which are frequently encountered.

Preparation.—Evacuation of the gastro-intestinal tract in advance. Usual local disinfection of the abdominal wall, umbilicus, and pubic region.

Position.—The operation is begun in the full dorsal decubitus – and subsequently the patient is put in the Trendelenburg posture, either in delivering the tumor, but especially after its delivery, and while dealing with its pedicle.

Landmarks.—Those of the infra-umbilical median abdominal line.

Anesthesia is always employed, as much intra-abdominal handling is expected. Analgesia is inappropriate. Bimanual examination, with relaxed abdominal wall, may throw encouraging light on continuing the operation – or may, on the other hand, lead to its discontinuance.

Incision.—Median infra-umbilical section. In cases of large and complicated tumors the original incision may have to be extensively lengthened. It is desirable to have the final incision sufficiently long to enable even a large tumor to be delivered outside of the abdomen before it is tapped to lessen its

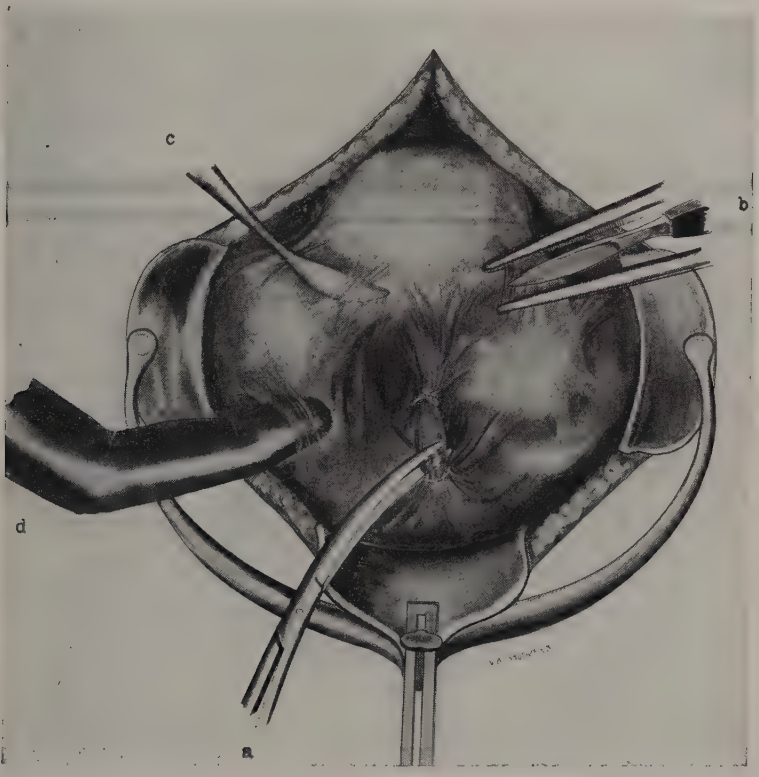


Fig. 5903.—Removal of Large Ovarian Cystic Tumor by the Abdominal Route – I; – Freeing peritoneal adhesions: – a, Dividing dense uterorectal band with scissors between ligatures; – b, doubly clamping utero-ovarian band of adhesion preparatorily to dividing it by knife; – c, freeing thinner utero-ovarian band with blunt dissector; – d, freeing filamentous recto-ovarian adhesions by finger.

size – which may carry the incision, though rarely, to the xiphoid cartilage. Sometimes a paramedian type of operation (Lenander's) is employed.

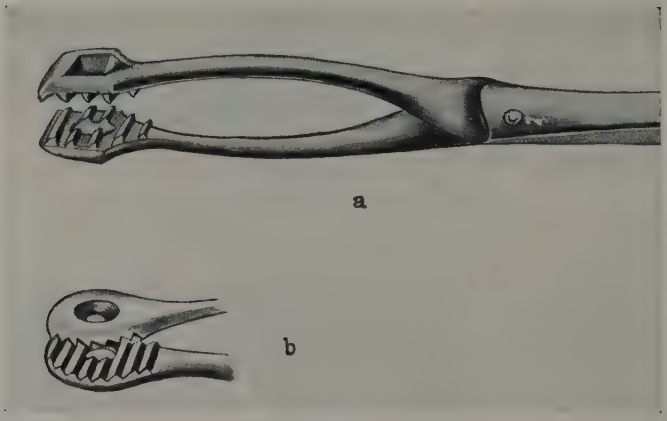
Operation.—On carrying the median incision through the abdominal wall in the ordinary manner peritoneal adhesions may be at once encountered – which, however, is usually not the case – and, when present, argues ominously for the rest of the procedure, where adhesions are usually expected to be encountered. The extensiveness and density of adhesions on opening the abdomen may be so great, however, as to deter the Surgeon from continuing with the operation, or cause him to adopt some modification of the plan originally conceived. The view of the intra-abdominal structures may present such an

appearance as shown in Fig. 5903 _ with such a matting together of the parts as to make it difficult to differentiate them.

Having encountered such an exceptional condition, and with the determination of proceeding with the operation, one must patiently settle down to untangling, as it were, the maze of confusion which may present itself _ and to so free the parts as to enable the subsequent manipulation to be carried out. The grade of the adhesions and the nature and importance of the struc-

Fig. 5904.—Modified Museux Clamp Forceps, Curved and Fenestrated.

tures bound together by them will largely determine the line of action as to the method of freeing the parts. Thinner, more limited bands or layers of adhesions may be separated by blunt dissection, with finger, or by blunt dissector (v. Fig. 5903, **c** and **d**. Somewhat thicker ones may have to be divided between clamps _ and denser ones still may have to be cut between ligatures (v. Fig. 5903, **b** and **a**). In still other instances part of the thickness of the wall of a viscus, usually of bladder or rectum, or coil of small intestine,



Figs. 5905 and 5906.—Pean's Cyst-grasping Forceps (above) _ Nélaton's Cyst-grasping Forceps (below).

must be sacrificed, with subsequent repair of the wall by suture _ or the wall of the viscus may be accidently entirely penetrated, either without at first knowing it, or in the act of trying to detach a site of adhesion with only the destruction of part of the thickness of the wall of the viscus _ the repair of which then becomes imperative before proceeding.

Fortunately, such extreme conditions are the exception _ more frequently minor or average grades of adhesions are encountered _ and sometimes the

pedicle of the tumor, which is the first goal of the operation sought after opening the abdomen, is exposable without encountering any adhesions.

As soon as the peritoneal cavity is entered the hand is placed upon the tumor and, guided by its contour, is carried over its entire surface, as far as this is possible, for the purpose of getting bearings as to its extent and connections. In the course of this passage minor adhesions between the surface of the tumor and the wall of the abdomen are readily broken down. Adhesions between the wall of the tumor and the intestines or the omentum, on the other hand, are more safely exposed by displacing the tumor to one side, and

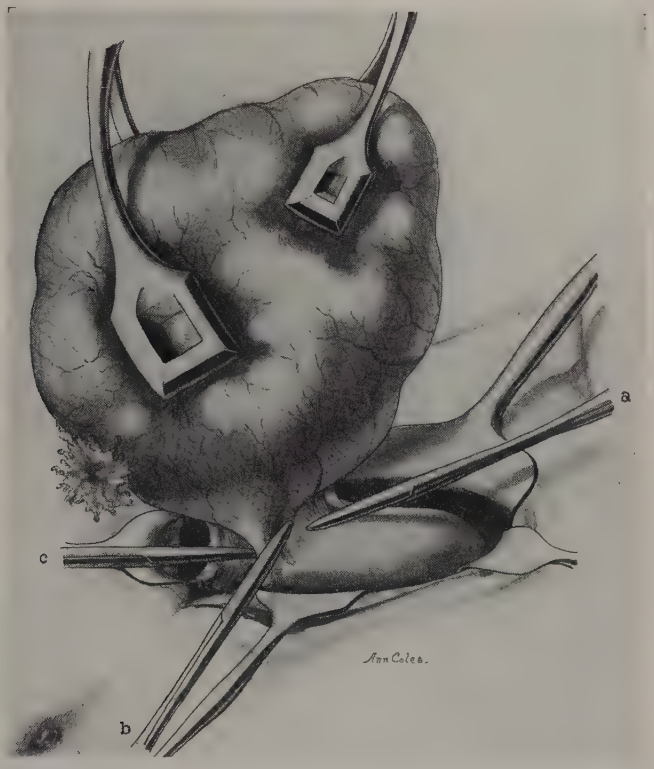


Fig. 5907.—Excision of Large Ovarian Cyst After Individual Clamp Control of the Chief Elements of Its Pedicle – I; – Individual clamping of the chief structures of the pedicle: – a, Clamp of the fallopian tube; – b, of the ovarian ligament; – c, of the infundibulopelvic portion of the broad ligament – all prior to division. The wound of entry is a median abdominal section, here drawn out of shape.

are then often able to be wiped off by a gauze-covered finger. Sometimes such adhesions must be tied off, at the expense of the tumor, rather than of the structure to be retained. Especial care is required in dealing with adhesions between the tumor and parts of the intestinal tract or the bladder. It is to be remembered that it is much easier to separate adhesions while the tumor is filled with fluid than after it has collapsed. It may be possible to manipulate the tumor largely by hand, but these maneuvers are aided by such forms of special holding clamps as shown in Figs. 5904 and 5906. But these should have teeth or blades which will not tear through the wall of the tumor, which though in large tumors is usually quite thick and strong. Premature

rupture of the tumor wall and escape of its contents is always embarrassing and unfortunate.

Progressing thus carefully, one either reaches the pedicle of the tumor, which is found free – or one frees his way down to the pedicle – adhesions being less apt to be encountered on entering the abdomen – and more apt to be found as the pedicle is approached. It is always desirable if adhesions can be freed before the delivery of the tumor through the abdominal wound – but sometimes the deeper adhesions – those immediately in the neighborhood of the pedicle – cannot be satisfactorily reached while the tumor is within the abdomen, even though it be pressed to one side – and, under such circumstances, it becomes necessary to deliver the free portion of the tumor

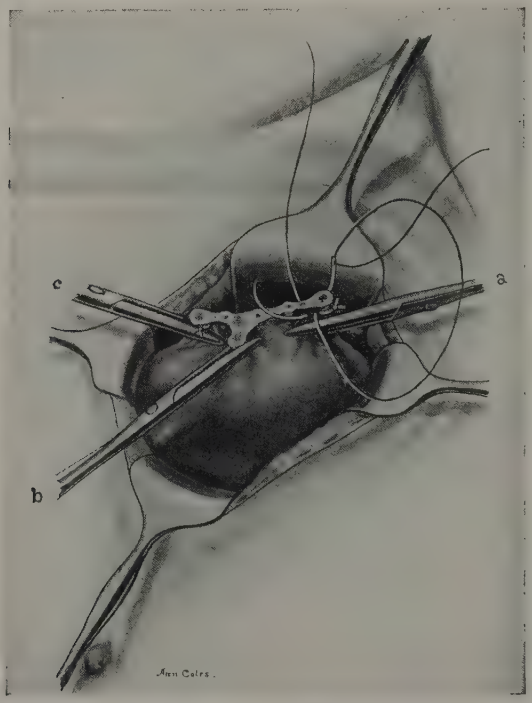


Fig. 5908.—The Same – II; – Ligating the chief individual structures of the clamped and divided pedicle: – a, Ligature of the fallopian tube; – b, of the ovarian ligament; – c, of the infundibulopelvic portion of the broad ligament and of the intervening structures of the bed of the pedicle – all after the prior clamping and division of the tumor mass.

through the abdominal opening before the non-freed portion can be exposed sufficiently to enable the deeper adhesions to be reached and separated.

When, finally, it is felt that the tumor is capable of delivery – or in those cases in which its freed portion must be brought through the abdominal wall before its unfreed portion can be reached, the margins of the abdominal wound are depressed by the hands of an Assistant, while the tumor itself is partly guided out of the abdominal opening by the hands of the Surgeon, and partly delivered through this opening by manual or instrumental aid – until, at last, the entire tumor, intact and unruptured, comes to lie outside of the abdominal cavity. All other structures which tend to bulge through the abdominal incision are held back by warm, wet, clamped towels. This is the more readily accomplished while the margins of the wound are drawn upward

and apart. Special provision must be made that after the tumor is delivered no tension shall be exercised upon its pedicle by the drag of its weight _ even if it be necessary to allot an Assistant or Nurse to this special duty. This is necessary both to avoid the effect of traction upon the pedicle of an ovarian tumor and because the manipulations about the pedicle, in finally clearing the tumor, are aided thereby.

When the tumor has been delivered two courses of procedure as to dealing with the pedicle are open: _ One may first clamp and tie the pedicle and divide it, and remove the tumor _ or one may first evacuate the contents of the tumor.

Fig. 5909.—Excision of Large Ovarian Cyst After Mass Control of Its Pedicle _ I; _ Crushing the structures of the pedicle *en masse* _ fallopian tube, ovarian ligament, and infundibulopelvic portion of the broad ligament: _ a, Angiotribe crushing the composite pedicle of a right ovarian cyst; _ b, traction clamps _ here shown controlling the opening into the cyst wall made by the cannula-trocar through which its contents have just been evacuated, and now serving, additionally, as tractors of the sac, to further expose the pedicle. The pedicle will be ligated in the tract which is being crushed _ and divided just beyond (distalward); _ c, uterus.

In dealing with tumors of medium size, and in those cases where the pedicle can be delivered well outside of the wound and its constituent structures exposed, it seems more satisfactory and surgical to individually clamp the main structures entering into the pedicle, or at least to clamp the pedicle in segments and tie off these segments _ or, if they be at all bulky, crush them first and then tie them _ and then divide the pedicle distal to the ligatures, and between the ligatures and one or more clamps applied still distal to the ligatures simply to control the fluid outflow from the tumor when the division is made. The structures which the clamp or clamps control are the fallopian tube, the ovarian ligament, and the infundibulopelvic portion of the broad ligament. If these individual structures can be sufficiently isolated in their

make-up of the pedicle, each set of the structures may be separately clamped by an intermediate type of clamp or forceps (Fig. 5907), crushed, and then tied in the crushed path – or simply clamped, and the distal portion of the pedicle divided (without opening the tumor wall) (Fig. 5908), and then the clamped stumps subsequently ligated with interlocked ligatures of strong silk.

Inability to expose the individual structures of the pedicle is often the case – so that the pedicle must be crushed *en masse* between uterus and tumor (Fig. 5909). After this the crushed pathway is teased apart in its center in a non-vascular region, if of medium size, and two interlocking ligatures of strong silk tied segmentally (Fig. 5910). If the pedicle be heavier and wider, it may be divided into three segments, each of which is separately tied, and then the limbs of the middle ligature carried around the two adjacent segments, thus individually tying the three segments, and then collectively tying them all together (Fig. 5911). The angiotribe clamps themselves may be then made to temporarily clamp the junction of the tumor with its pedicle,

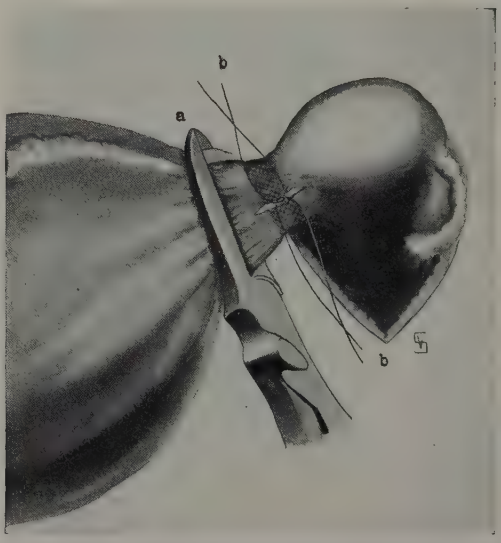


Fig. 5910.—The Same – II; – The crushed pedicle is being ligated in two segments by two interlocking ligatures.

distal to the permanent ligatures, while the pedicle of the tumor is being divided – thereby using the clamp to lift the tumor away with, and to keep its fluid within it (v. Figs. 5910 and 5911).

In dealing with tumors of great size, especially when complicated with adhesions which cannot be freed sufficiently to allow the tumor to be delivered outside of the abdomen far enough to also bring its pedicle outside the abdominal incision, or near enough to it for satisfactory manipulation, it is often indicated, after delivery of the tumor has been made to the maximum extent to which it is possible, to aspirate the fluid contents – after which the walls of the collapsed tumor will usually be so flaccid that it at once becomes possible to deliver a considerably larger amount of the pedicle out of the wound – and, under these circumstances, often the entire pedicle – so that it can be then dealt with in the same manner as though the entire pedicle had been delivered from the first. A self-retaining form of cannula-trocar, with long

rubber tube attached, is employed – the fluid of the tumor being thereby conducted away from the field of operation (Fig. 5912).

Fig. 5911.—The Same – III; – A larger ovarian pedicle, crushed, has been divided into three segments, each of which has been ligated with stout silk, after which the limbs of the middle ligature have been tied around the adjacent segments. The distally applied angiotribe (in this and in the preceding picture) is now simply used as an ordinary clamp to steady the tumor during removal.

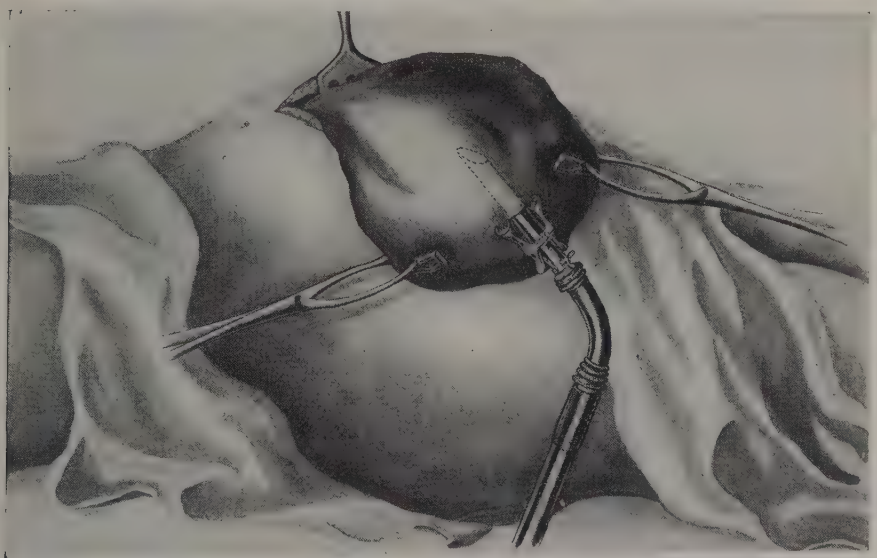


Fig. 5912.—Evacuation of Large Ovarian Cyst After Delivery by Cannula and Trocar; The ovarian cyst has been delivered outside of the abdomen – but not far enough to expose its pedicle – to accomplish which the fluid contents are being evacuated by means of a self-retaining cannula-trocar, with tube attachment to conduct away the fluid. The sac is being steadied, and carefully drawn upon, by adjacent clamps.

In still other instances it is impossible to so bring the pedicle of the tumor into the field as to gain altogether satisfactory access to it – whether or not the tumor sac be emptied of its fluid. This is conceivable in those cases where

the uterus has formed dense adhesions with the rectum, so that forced delivery would certainly rupture the rectum. In these cases the pedicle of the tumor may have to be ligated while it is *in situ* (Fig. 5913). In the case of a small tumor which can be well displaced to one side, this may be accomplishable without first evacuating the tumor – and, in others, it may be better to first collapse the tumor by aspirating its contents. The pedicle is then stoutly ligated by single or interlocking ligature as a whole or in two segments – and without or after crushing. The pedicle is then clamped still distal to the ligatures, and is divided between clamp and ligatures – and removed.

To prevent unnecessary adhesions after operation the ligated stump of the pedicle is entirely covered by peritoneum – which is accomplished either by

Fig. 5913.—Ligature and Clamp Control of the Pedicle of the Undelivered Ovarian Cyst; – The pedicle of the unemptied cyst has been clamped below the fingers of the hand lifting its weight from the abdominal cavity – while, proximal to the clamps, an interlocking ligature is being tied around the pedicle. Curved scissors will divide the pedicle between clamp and ligatures. The uterus is shown firmly adherent to the anterior rectal wall, so that it cannot be brought upward and forward.

suturing together the opposite margins of the adjacent divided peritoneum, if the section be long – or by running a purse-string suture through the margins of the peritoneum freed by division of the pedicle, and then gathering these margins together, purse-string fashion, if the pedicle be small.

Finally, any soiling of the peritoneal cavity is sponged away – a general examination of the intraperitoneal organs and structures made – and the abdomen closed in the usual manner (and, unless there be infection, or the circumstances be unusual, without drainage).

Comments.—The Trendelenburg position is useful in proportion as the adhesions are deep in the pelvis – and the falling away of the obstructing intestines is accomplished. If there be any danger of rupture of the sac,

especially if infection or malignancy be feared, a position should be maintained which will keep all fluids in the pelvic cavity, rather than diffused, until removed.

Bland-Sutton advised section from xiphoid to pubis if necessary to secure sufficient room for necessary manipulation in these cases – as resulting in less damage to the intra-abdominal structures in difficult cases.

When the peritoneum is found adherent to the tumor at the site where it is first sought to open the abdomen, it is sometimes wiser to incise higher, into the free cavity – and then come down upon the site of adhesions.

It is to be remembered that the bladder may be displaced so far upward into the abdominal line that it may be incised in opening the abdomen. A sound should always be used in suspected cases.

The cyst should never be tapped until delivered outside of the abdomen – and if it be impossible to entirely accomplish this, it can be accomplished at least in part by inclining the patient to one side.

While the wall of a large cyst of long standing is apt to be tough, some cyst walls have been encountered so frail that they have prematurely ruptured. Rather than have this occur it is wiser to drain off their contents early in the work – especially if complications be present.

Adhesions are to be expected when not anticipated – just as they may never be found when fully counted upon.

The adhesions which are most frequently encountered are omental.

The pedicle of an ovarian cyst is usually composed of the following structures – the ovarian ligament, fallopian tube, and ovarian vessels, pampiniform plexus, nerves, lymphatics, all of which lie in the neighboring broad ligament – together with part of the infundibulopelvic portion of the latter. The round ligament is sometimes included.

All ligatures of the pedicle should be of stout silk or linen, and should be placed by transfixion and reinforced by double or interlocked tying. Some Surgeons use only catgut.

It is often difficult to detect the cleavage line between the adherent peritoneum and the cyst wall – unless the site of adhesion can be approached from some non-adherent region.

A special form of self-retaining, aspirating trocar and cannula is much better than the old fashioned type of trocar and cannula – in that leakage is less apt to occur. After entering the main cyst cavity it may be necessary to enter secondary cavities before the whole cyst can be evacuated or sufficiently evacuated for further progress.

Adhesions between the involved structures and the rectum are the most difficult to deal with – and the rectum is the most easily torn – and the consequences thereof the hardest to repair. It is well, where possible, to cut around the adhesion, leaving part of the adherent structure in contact with the rectum.

The wound left in the free upper and lateral infundibulopelvic portions of the broad ligament may be quite extensive – and the entire raw margins thus left, as well as the stumps of the pedicle, should everywhere be covered by uniting the opposite peritoneal margins over them.

All cysts should be carefully handled against rupture – colloid cysts being especially apt to break.

If any question of infection be present, temporary drainage of the peritoneal cavity should be instituted.

It will sometimes happen that ovarian cysts are encountered whose walls are so densely adherent to neighboring structures which, at the same time are so important, that separation of these adhesions is out of the question – and still,

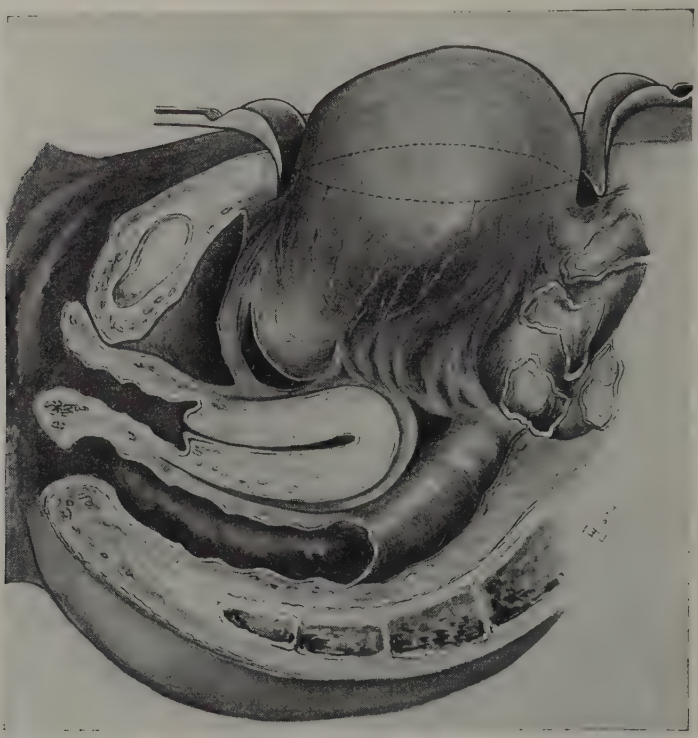


Fig. 5914.—Marsupialization of a Large Ovarian Cyst Densely Adherent to Uterus, Bladder, and Intestines – I; – The area above the dotted line represents the only portion of the sac which is sufficiently free to be excised.

Fig. 5915.—The Same – II; – Following the excision of the upper, non-adherent portion of the ovarian cyst the margins of the portion of the cyst wall remaining irremovably adherent to important structures is now sutured into and around the lower margins of the abdominal wound – shutting off the general peritoneal cavity, but causing the interior of the remainder of the sac to communicate with the exterior.

without some attempt for relief, the patient must eventually die. Under such circumstances there remains no other course but to resort to marsupialization of the sac of the cyst. Its contents are first withdrawn by aspiration — and then all the free portion of the cyst which extends above a level which can be brought up to the level of the lower plane of the abdominal wound is circularly excised (Fig. 5914). Any loculi which are found within the remaining portion of the cyst are broken down — and care taken to keep all escaping fluid from entering the free peritoneal cavity. The margins of the ovarian sac are then sutured into the lower plane of the abdominal opening — so that the peritoneal surface of the sac and the parietal peritoneum will come into contact and thereby soon seal off the general cavity (Fig. 5915). Finally, the cavity of the sac is packed with gauze — and the wound dressed. For a considerable time thereafter the interior of the remaining portion of the sac will suppurate — but it will gradually diminish in size under the influence of intra-abdominal pressure — and the amount of packing which can be placed within it will correspondingly decrease — until the tract dwindles down to a sinus — or becomes entirely obliterated by adhesions of the opposite walls.

OÖPHOROSALPINGECTOMY BY THE ABDOMINAL ROUTE

Description.—Oöphorosalpingectomy or ovariosalpingectomy is an operative procedure in which both ovary and tube are simultaneously excised. The combined operation is sometimes termed salpingo-oöphorectomy or salpingo-ovariectomy. The removal of these structures is usually called for by some inflammatory, infective, or cystic involvement. Their removal, however, is unjustifiable, provided they can be safely saved by some conservative type of operation — especially the ovary. Because the ovary may have to be sacrificed, the tube should not be removed for that reason alone — but should have a worthy cause of removal of its own — and the same is true of the ovary when the tube must be removed. In the operation here described the following structures will be removed: — the entire ovary, entire fallopian tube, part of utero-ovarian ligament, and the arteries, veins, lymphatics, nerves, and broad ligament belonging to these structures.

Preparation.—Median line and pubis shaved. Bowels and bladder emptied.

Position.—Patient supine near edge of table at first — and subsequently elevated into slight Trendelenburg position after the abdomen is opened. Surgeon on side of operation — or always on patient's right, independently of ovary operated upon — or may prefer to cut upward, and then stands on patient's left in both cases. Assistant opposite.

Landmarks.—As for median abdominal section (Vol. IV, p. 91).

Incision.—In median line — about 5 to 10 cm. (2–4 inches) in length — extending upward from a point about 2.5 cm. (1 inch) above the symphysis pubis.

Operation.—Having performed a median abdominal section — control hemorrhage — and retract lips of abdominal wound. Pass the first and second fingers into the wound, with the back of the hand to the abdomen — follow down the under surface of the abdominal parietes to the symphysis — thence down on to the bladder and uterus — and thence out laterally over the superior cornu of the uterus, with the palm of the hand still downward, to and along the broad ligament — along the posterior superior aspect of which the fallopian tube is found — and, just posterior to the tube, the ovary. These structures are drawn toward the median line into an accessible position in the abdominal wound (Fig. 5916).

The ovarian artery and veins are first tied with silk or chromic catgut – the ligature being carried, upon a laterally curved aneurysm needle, through the clear space of the broad ligament and tied over the top of the indundibulopelvic ligament, outside of the fimbriated end of the fallopian tube, and close to the brim of the pelvis (Fig. 5917). The utero-ovarian ligament, lying behind the fallopian tube, is ligated with chromic gut, rather nearer the uterus, carried upon a laterally curved aneurysm needle. The inner end of the fallopian tube and the upper free part of the broad ligament are ligated with

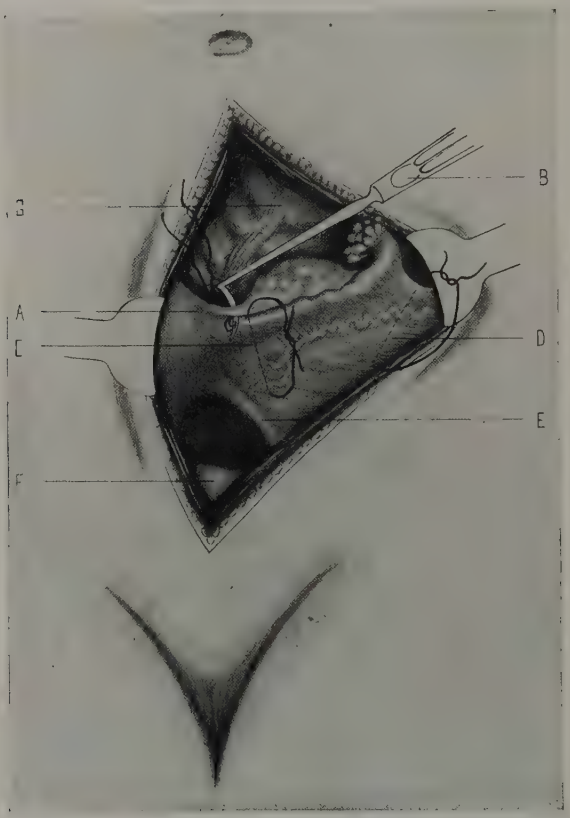


Fig. 5916.—Oöphorosalpingectomy by the Abdominal Route: – A, Uterus; – B, aneurysm needle carrying ligature around utero-ovarian ligament; – C, ligature passing through broad ligament and surrounding fallopian tube and ovarian artery; – D, ligature passing through broad ligament and over free edge of infundibulopelvic ligament and surrounding ovarian artery; – E, round ligament; – F, bladder; – G, colon.

silk near the horn of the uterus – which ligature also controls the branches from the uterine artery. The tied structures are seen in Fig. 5917.

The structures are now removed by cutting through the broad ligament well within the outer ligature of the ovarian vessels – and cutting through the fallopian tube and ovarian ligament well to the outer side of their ligatures – and carrying the incision through the broad ligament well below the hilum of the ovary (Fig. 5918). Any doubtful ligature is strengthened, and any bleeding point is surrounded by an additional gut ligature. The edges of the anterior and posterior layers of the broad ligament left by the removal of the above structures are sutured together with gut. The patient is lowered to

the horizontal position – and the intestines and omentum are replaced. The abdomen is closed, as after median abdominal section.

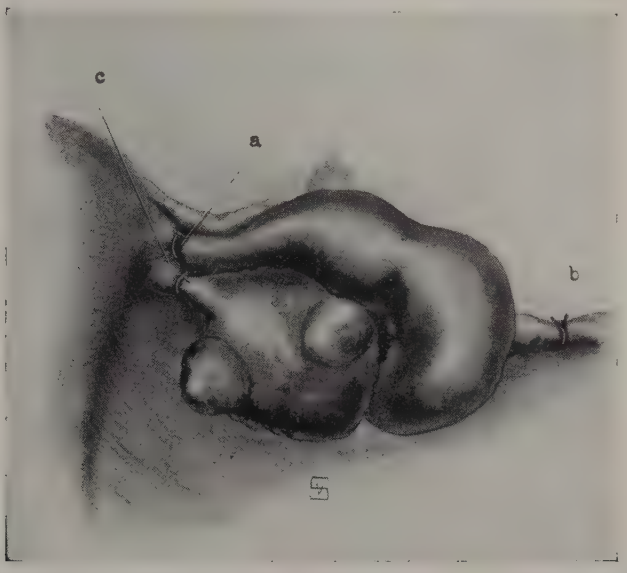


Fig. 5917.—OÖPHOROSALPINGECTOMY BY THE ABDOMINAL ROUTE – I; – Ligations preliminary to excision of the ovary and tube: – a, Proximal ligature of the fallopian tube; – b, ligation of the ovarian vessels in the free border of the infundibulopelvic portion of the broad ligament; – c, ligation of the utero-ovarian ligament.

Fig. 5918.—The Same – II; – Suturing the bed of excision; – The uterine tube, ovary, and adjacent portion of the broad ligament have been excised between ligatures of silk or chromic catgut – and the opposite edges of the broad ligament in the wound bed are being brought together by fine chromic catgut suture – the opposite peritoneal coverings of the broad ligament covering at the same time the ligated stumps.

Comment.—The main danger in the operation is from uncontrolled hemorrhage. Where there is any danger of a ligature slipping, one end of the ligature may be carried through neighboring tissue and knotted to the opposite end.

The operation may be considerably complicated by adhesions – the method of dealing with which has been described in connection with the large cystic ovaries (v. p. 536).

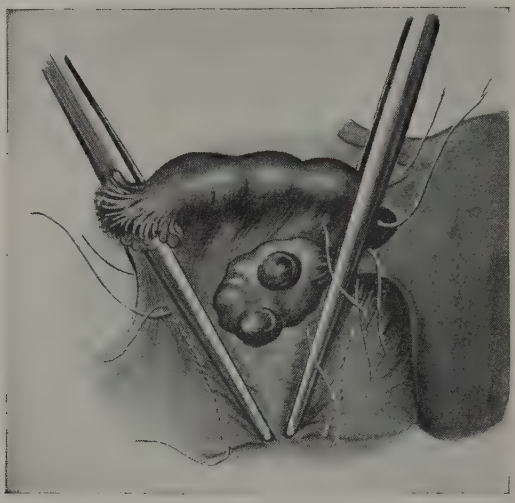


Fig. 5919.—Abdominal Oöphorosalpingectomy by V-shaped Excision, Including the Adjacent Portion of Broad Ligament – I –: The structures are clamped off in V-shaped fashion, after which outlying interlocking ligatures are placed controlling the proximal and distal blood-supply of ovary and tube – to be followed by excision within the clamps.

Each structure – ovary and tube – is sometimes best removed through its own incision – especially when not interadherent – rather than through a common incision or excision.

The region of the appendages is sometimes walled off by interlocking ligatures carried through the broad ligament structures, and tied before the

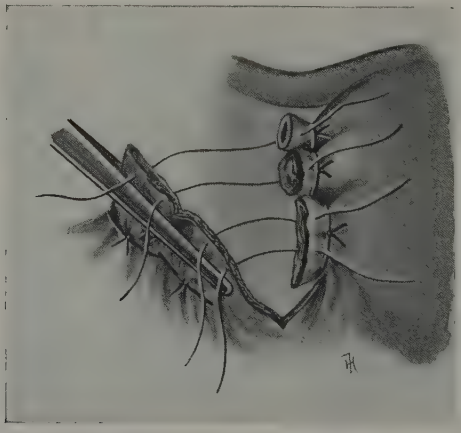


Fig. 5920.—The Same – II; – Suturing of the broad ligament stumps together following excision.

parts are excised – as shown in Fig. 5919. The involved structures are then excised in V-shaped manner, guided or not by clamps temporarily placed within the areas where the ligatures have been loosely carried, to be tied after

the parts have been excised and the clamps removed (Fig. 5920). In uniting the stumps left after this technic raw surfaces should everywhere be covered by the peritoneum of the two aspects of the broad ligaments – so as to lessen the likelihood of adhesions.

It is especially desirable, in whatever method may be adopted, that the broad ligament be not left markedly deformed or tensed – and that all raw surfaces be covered by peritoneum.

In proportion as the case is acute, where one is operating for pus tubes, is there danger of general peritoneal infection – and in proportion as it is chronic, are difficulties from adhesions to be expected.

Whether temporary drainage is to be established following operation will depend largely upon the pathology of the case.

TRANSPLANTATION OF OVARIAN TISSUE, AUTOTRANSPLANTATION, OR HOMOTRANSPLANTATION – AND HETEROTRANSPLANTATION

In autotransplantation or homotransplantation the ovarian tissue is transplanted from the original site to another site in the same patient. In heterotransplantation the transplantation of ovarian tissue is made from a donor to the recipient.

The transplantation of ovarian tissue is indicated for two distinct purposes – for restoring or maintaining the function of fertility in the female – or for the purpose of preserving the contribution of the ductless-gland feature of the ovary to the woman for general bodily well-being and functionation. Both of these objects are sought before and during the child-bearing period – and the latter may be sought after the ovary has ceased to functionate as a contributor to progeny.

Whether in autotransplantation or in heterotransplantation, the ovarian tissue removed from its original blood-supply only survives temporarily – usually not beyond a year or two. During the period of its survival – that is, up to the time of the degeneration of the ovarian graft as functionating ovarian tissue, a maintenance of functionation, as to prolonging menstruation, and as to the ductless-gland feature of the ovary's contribution to the physical economy, in the direction of general sexual feeling and well-being, may be expected – but the fertilizing effect of such graft is to be expected only exceptionally in human beings after autotransplantation – and not at all after heterotransplantation (though it has been reported). In animals fertility has been demonstrated not only after autotransplantation, but even after heterotransplantation.

The chief problem in the temporary survival of an antotransplantedo varian graft is one of vascularization. The chief cause of failure in heterotransplantation probably lies in the physiologic antagonism in the blood and tissues of donor and recipient.

Some of the summaries of Franklin H. Martin, in a series of writings upon ovarian transplantation, will be here given:

Ovarian homotransplantation, human and animal, will during the lifetime of the transplant prevent the atrophy of the genitalia, which is the usual sequence of double oöphorectomy.

It has not been definitely shown that heterotransplantation of the ovaries will invariably prevent the nervous phenomena and the genitalian atrophy which are due to follow the removal of the ovaries.

Ovarian heterotransplantation in women and animals may prevent genitalian atrophy following removal of the ovaries.

Menstruation continues in women and in monkeys following ovarian homotransplantation.

Pregnancy has followed both ovarian homotransplantation and heterotransplantation in animals.

Pregnancy has followed ovarian homotransplantation in women.

Pregnancy has been reported as following ovarian heterotransplantation in women.

Heterotransplantation accomplishes most when performed the shortest time after the removal of the ovaries from the patient who is to receive the transplant – and before time for genitalian atrophy and the atrificial establishment of menopause.

Ovaries transplanted into other localities than the vicinity of the uterus are due to survive, perform their function, and prevent the phenomena ordinarily following double oöphorectomy.

Transplantation of the ovaries, in whole or in part, is accomplishable by anchoring or embedding the sectioned surface of the graft upon or into tissue well supplied with blood – the uterine horn, broad ligament, parietal peritoneum, or into the connective-tissue plane, or into the muscle of the abdominal wall or limb – and without blood-vessel anastomosis.

The satisfactory implantation of even a portion of an ovary practically anywhere in the body supplies to the recipient the necessary contribution (secretion, stimulus, or influence) to preserve her sexuality and other characteristics which are due to disappear with the removal of the ovaries.

Heterotransplantation, of ovaries even where donor and receptor are of the same species, is not as successful as is homotransplantation – because of ill-understood reasons – probably for the reason that those closely related seem less antagonistic to each other's grafts – a definite antagonism existing between the blood, or the tissue of the recipient to the graft of the donor, or vice versa, increasing with the removal of relationship between the two.

No antagonism exists between the blood or tissue of the individual to her own ovarian graft.

The frequent non-success in ovarian transplantation between persons of the same species seems due not so much to technical difficulty, as to blood or tissue antagonism – suggesting directions in which it is to be sought to overcome the present lack of success.

Tuffier states that ovulation in the absence of menstruation (as, for instance, where the uterus is excised) is altogether valueless. In reporting 204 cases of ovarian transplantation which he had performed, 24 were of heterografting – in which none was successful. Among these he mentions an instance of the preservation of the ovary in cold storage for as long as forty-four days prior to transplantation.

Because of the greater range of application in heterotransplantation of ovarian tissue that is particularly the field for future exploitation – but, practically, as matters stand, antotransplantation is the technical procedure which holds out the greatest hope of success in the individual case.

Two methods of ovarian autotransplantation will be described – one in which pregnancy may be hoped for from the implant – and the other, in which it is not sought, but only the ductless gland feature of the glandular tissue.

Ovarian Autotransplantation in Communication with the Uterine Cavity with the Hope of Pregnancy from the Implant.—The method about to be described is especially employed in those cases where the corresponding fallopian tube on each side has been excised, and the stumps of the uterine tubes are healthy and the lumina of the tubal canals into the uterine cavity are patulous. The proximal end of the uterine tube, at the horn of the uterus, is excised in wedge-shaped fashion – in such manner as to leave a wedge-shaped

cavity in the horn of the uterus, made at the expense of the tube, and at the site where the tube joins the uterus (Fig. 5921). The freedom of the site from scar tissue and the patulousness of the tube are tested by finger and probe. When this has been done a wedge-shaped slice of ovarian tissue, the healthiest available, is excised from the ovary – such as might represent the one-fourth or one-eighth segment of an apple. This segment of ovary is transferred directly from the ovary into the tubo-uterine pocket prepared for it – with the apex of the graft fitting into the apex of the wound, and the serosa of the graft outermost – thus approximating the two raw surfaces of the graft to the two raw surfaces of the prepared pocket. The adjacent margins of the tubo-ovarian serosa are then sutured over the buried ovarian segment with catgut stitches – and the wound in the two ovaries closed – unless one or both are to be removed. Such a bed as this furnishes good vascularity for the graft – which is of paramount importance.

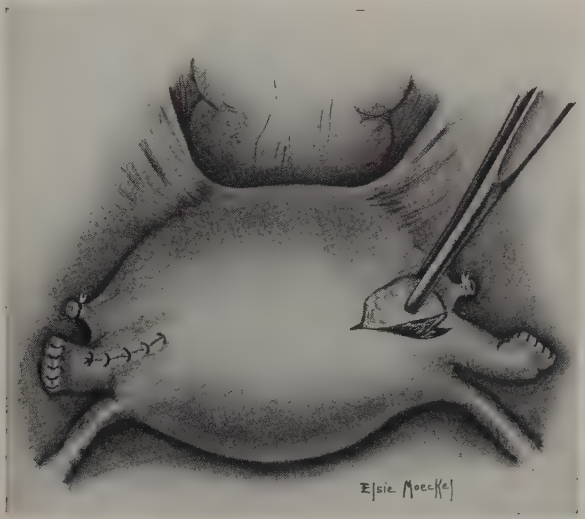


Fig. 5921.—Ovarian Transplantation in Communication with the Uterine Cavity; – Both ovaries and both tubes have been excised. The beds of the ovaries, in the broad ligaments, have been closed – and the outer portions of the beds of the tubes. Wedge-shaped segments of the ovaries are being buried in beds prepared for them by corresponding wedge-shaped excision of tubo-uterine tissue at the horns of the uterus.

Ovarian Autotransplantation or Heterotransplantation in the Broad Ligament, Adjacent to the Uterus and Within Grasp of Healthy and Patulous Fallopian Tubes – With or Without the Expectation of Pregnancy.—A bed for the ovarian segment is here made into the broad ligament by incision – or if the major portion of the ovary must be lost, or in case an ovarian graft be taken from another patient, then in the bed of the excised ovary a smaller bed may be made for the wedge-shaped segment of the ovary to be grafted, and the rest of the ovarian wound bed be closed about it. In either case the apex of the graft is pressed into the wound bed prepared for it, the margins of which are sutured to the margins of the convex outer aspect of the graft, along the borders of the serosa which covers the base of the wedge – and which stands exposed to the possible grasp of a healthy fallopian tube.

Ovarian Autotransplantation or Heterotransplantation Into Some Distant Part of the Body – Where Only the Non-fertilizing Contribution of the Gland is Sought to Be Preserved.—While even in these cases some

close vicinity of the uterus is usually employed – especially burying of the ovarian segment between the leaves of the broad ligament – yet any convenient locality may be chosen – provided it be well supplied with blood. A site often chosen is between the outer surface of the rectus muscle and the overlying aponeurosis, which is temporarily lifted from the muscle for that purpose, and then dropped back over the graft (Fig. 5922), to be treated, in the closure of the abdominal wound, as the margins of the rectal aponeuroses usually are, and without any regard to the presence of the graft. One of the reasons for choosing this last-mentioned position is that the ovarian graft is apt to eventually become cystic, and if trouble arises in consequence, the site of implantation is extraperitoneal and easily reached.

Comments.—The chief field for ovarian transplantation as employed at present is to arrest or prolong the establishment of the menopause, and to

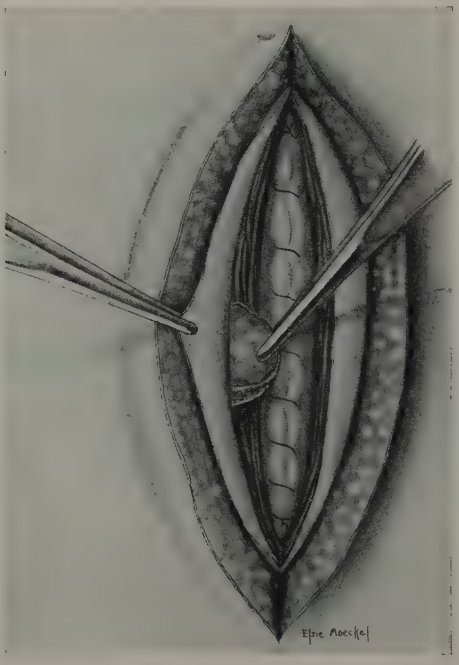


Fig. 5922.—Ovarian Transplantation Between the Rectus Muscle and Its Aponeurotic Sheath.

supply the glandular contribution of the ovary to the system at large – the hope for fertility being small – indeed, practically negligible.

A slice of ovarian tissue not greater than 3 mm. ($\frac{1}{4}$ inch) in width at its base is often used – though a graft of greater bulk would seem better – provided, possibly, that if too large, its entire thickness might not be permeated by the blood poured into the wound, until its definite circulation could be established.

It is better to transfer the graft directly from its source of supply to its prepared bed – but if this cannot be done, then it should be kept in blood-warm normal saline solution, or in contact with the peritoneum until used.

A slice of ovary with two raw surfaces is more apt to grow in its new bed than a whole ovary implanted therein. Through the covering of the ovary nutriment less readily comes than through the slice.

Ovarian tissue severed from its original blood-supply eventually degenerates into the equivalent of connective tissue – usually within a few months, up to a couple of years. Therefore, rather than excise all of the ovary and then reimplant a part of it, it is wiser to excise nearly all of it, leaving the small part that would otherwise have been the graft contributed by the whole ovary.

In depending upon grafts, although the menopause will eventually occur, it comes about much more gradually, with less constitutional upheaval.

An ovarian graft so implanted that it may be pressed upon if it becomes cystic may necessitate operation for relief.

Ovarian grafts have been made into the breasts, thighs, and the like.

No matter where placed, it is well to anchor the graft by a fine catgut suture or two. For from some of its unusual sites it might become displaced.

SALPINGOPEXY FOR PROLAPSE OF THE FALLOPIAN TUBES

Description.—One or both fallopian tubes may become downwardly displaced into the uterorectal pouch. A corresponding prolapse of one or both

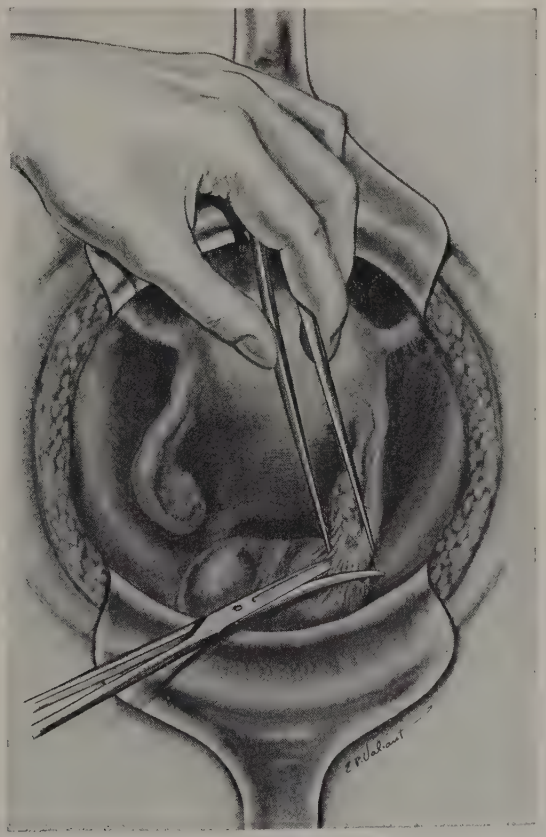


Fig. 5923.—Freeing Ovaries and Tubes from the Adhesions Which Hold Them Backwardly and Downwardly Displaced Into the Recto-uterine Pouch – Prior to performing oöphoropexy or salpingopexy.

ovaries may occur – as has been explained (v. p. 528). Owing to the common attachment of the ovary and tube of each side to the broad ligament, and their

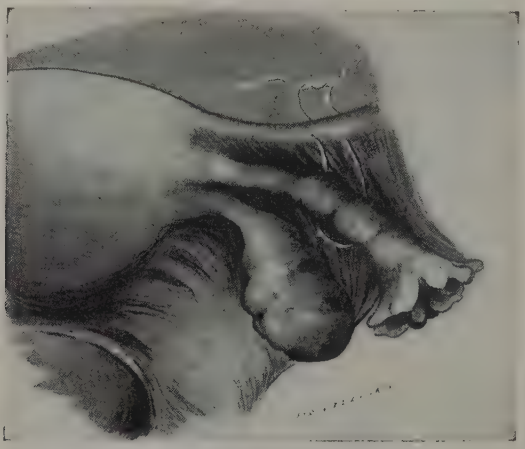


Fig. 5924.—SALPINGOPEXY – by elevation of the right uterine tube (carrying with it its corresponding ovary) and suturing it to the round ligament by its mesosalpinx.

Fig. 5925.—DOUBLE SALPINGOPEXY – both tubes, with their ovaries, have been freed from the uterorectal pouch – and the tubes are anchored to the parietal peritoneum of the brim of the pelvis.

proximity to each other, the downward displacement of one almost necessarily involves the downward displacement of the other. Conversely, the uplifting of one also uplifts the other. The drawing upward of the fallopian

tube, which is naturally placed upon a higher plane than the ovary, draws the ovary along with it — unless the latter be held down by its special adhesions.

Salpingopexy.—The technic consists in suturing the prolapsed uterine tube into some position more nearly approaching its normal site — and in such relation with the ovary that it may readily grasp that structure during the menstrual nisus.

The procedure presupposes a free tube and corresponding ovary — and if either structure be held down by adhesions, these must be first freed (Fig. 5923). The prolapsed tube may then be attached to one of several sites.

Anchorage of the Prolapsed Tube to the Round Ligament.—The uterine tube is lifted out of Douglas' culdesac, drawing with it the ovary — and is sutured to the round ligament of its side. A loop suture is passed through the round ligament and through the mesosalpinx beneath the tube (carefully avoiding passing through its lumen) — and when this suture is tightened the tube is drawn upward and forward into contact with the round ligament (Fig. 5924).

Anchorage of the Prolapsed Fallopian Tubes to the Infundibulopelvic Ligaments.—This is an intermediate degree of elevation at which to perform the anchorage. It may, however, be the most available site in the particular case — owing to adhesions or other circumstances — and a very much better position than the one in which the tube and ovary may be found.

Anchorage of the Prolapsed Fallopian Tubes to the Brim of the Pelvis.—The freed tubes, carrying with them their ovaries, are elevated to the brim of the pelvis, upon either side, and are there anchored to the parietal peritoneum by a few sutures (Fig. 5925).

Comments.—By the operative measures just mentioned a twofold result is accomplished — relief of suffering from the prolapse of the ovaries — and increased likelihood of fecundity through the restoration of tubes and ovaries to more normal positions.

SALPINGOSTOMY FOR IMPROVING THE TRANSMISSIBILITY OF OVULES

Description.—The fallopian tubes are sometimes partially or wholly impervious to the passage of ovules from the surface of the ovary into the uterine cavity. Salpingostomy consists in making a new mouth or opening in some part of the uterine tube. This impermeability may be because of kinks and other postural conditions — which the operation of salpingopexy, and the freeing of adhesions, just described (v. p. 528), usually correct. But in the majority of cases the lumen of the uterine tube is impervious because of adhesions between its walls due to inflammatory processes — and often to infection. The internal ostium and the lumen of the inner portion of the canal usually remain patulous — the outer extremity of the tube, especially the external ostium, generally being the site in which the canal is obliterated.

As the cause of the conditions is, in the majority of cases, gonorrheal infection of the fallopian tubes, one must proceed with extreme caution in the reopening of the outer end of the tube for purposes of fecundity — for the obliteration of the external ostium in such cases is conservative on the part of nature — and the re-establishment of the opening has resulted in general peritoneal infection and death in a number of cases. In cases in which this extreme result does not follow attempts to form a new opening, yet through the persistent presence of goncocci, the secondary opening is also apt to become sealed. The artificial opening even independently shows a tendency to close — and usually does so, unless provision be made for ample eversion of the mucosa

The operation often fails for these or other reasons — but is a warrantable

procedure in those cases where, in the course of opening the abdomen in a woman known to be sterile, such a condition is encountered, and, at the same time, the tubes are known to be healthy.

The patulousness of the uterine tube should be reasonably tested before concluding that it is non-pervious. This has been accomplished in various ways. The passage of a fine probe from external to internal ostium is the most satisfactory. The inflation of the tube with air or distention with sterile solution has been employed (Fig. 5926, **a**).

Several methods of performing salpingostomy are employed _ some of which are here given.

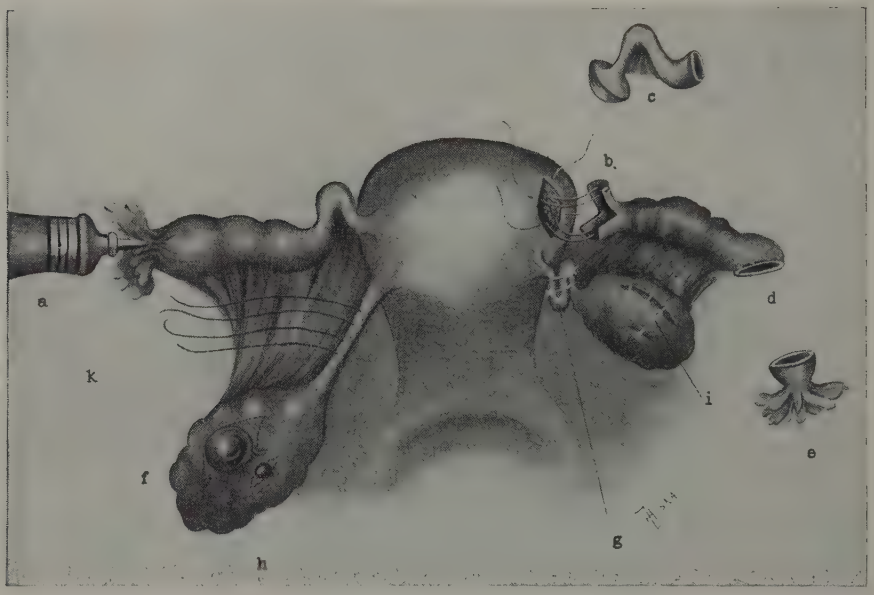
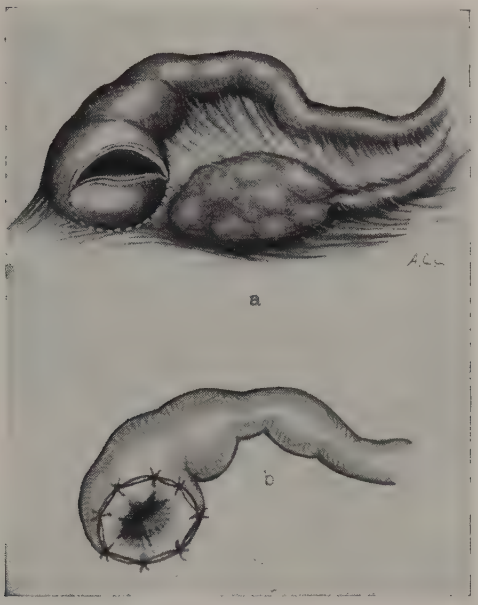


Fig. 5926.—Conservative Operative Procedures Upon the Ovaries and Tubes: _ **a,** Testing the patulousness of the uterine tube by the injection of saline solution or air; _ **b,** excision of the twisted, impervious proximal end of the uterine tube and, contiguously with this, of a wedge-shaped piece of the horn of the uterus, **c,** down to the internal ostium _ after which the split inner end of the tube will be sutured into the wedge-shaped cavity; _ **d,** salpingostomy by oblique terminal division of the tube; _ **e,** the portion of the tube excised; _ **h,** elliptic excisions of small ovarian cysts _ with, **i,** the resulting wound, sutured; _ **f,** prolapsed ovary; _ **k,** sutures placed in the ovarian ligament which, when tied, will shorten it (Imlach's oöphoropexy); **g,** oöphoropexy by doubling and suturing of the ovarian ligament upon itself. (Modified from Bovee.)

Salpingostomy by Transverse Terminal Division of the Tube _ Followed by Salpingorrhaphy.—The outer end of the tube is divided transversely by knife or scissors _ at the expense of the serosa rather than of the mucosa _ so that a redundancy of mucosa will be provided. This is accomplished by practising traction upon the terminal end of the tube, while a sharp knife is carried around the tube through the serosa, on a circular level nearer the uterus than the mucosa will be divided _ and then unrolling the serosa, as it were, from the distal end before dividing the mucosa _ so that a longer cuff of mucosa will be provided than of serosa. The margins of the redundant mucosal cuff are then sutured with fine catgut to the margins of the serosal cuff. In Fig. 5927, **a** a simple transverse section is made. In Fig. 5928, **b** is shown how the mucosa has been drawn well outward in excess, and sutured in the form of an ectropion to the margins of the mucosa.

Salpingostomy by Transverse Division and Splitting – Followed by Salpingorrhaphy.—In this procedure the distal end of the uterine tube, at



Figs. 5927 and 5928.—Salpingostomy by Transverse Terminal Division of the Tube, Followed by Salpingorrhaphy: – a, The distal end of the distended fallopian tube is being transversely divided; – b, the tubal mucosa has been drawn out, in excess, and sutured to the margins of the tubal serosa – so that there will be a pouting redundancy of mucosa to provide against the disappearance of the lumen by contraction.

Fig. 5929.—Salpingostomy by Transverse Division and Splitting.

the point where it seems normal, is divided transversely – after which the tube is limitedly split laterally upon that aspect nearest to the ovary. The

mucosa of the tube is then drawn out and sutured to the serosa, so that the former presents a rolled-out appearance (Fig. 5929).

Fig. 5930.—Salpingostomy by Oblique Terminal Division of the Tube _ Followed by Salpingorrhaphy _ I; _ The oblique section of the distal end of the tube.

Fig. 5931.—The Same _ II; _ The margin of the tubal mucosa has been sutured to the margin of the tubal serosa _ but the former should be drawn out in much greater redundancy than here shown _ to provide against inevitable future contraction and narrowing of the opening.

Fig. 5932.—Salpingostomy by Oblique Terminal Division of the Tube _ Followed by Salpingorrhaphy _ and Then by Salpingo-ovario-syndesis _ Clado; _ After the steps described in the preceding technic have been carried out, the margin of the new opening is circularly sutured by interrupted catgut stitches to the surface of the ovary.

Salpingostomy by Oblique Terminal Division of the Tube _ Followed by Salpingorrhaphy.—The procedure here is exactly the same in principle

as that just described, except that, in this instance, the terminal section of the tube is made obliquely (Fig. 5930). A redundancy of the mucosal cuff is then drawn from within the lumen of the tube and sutured to the peritoneal margins. This suturing is seen in Fig. 5931 _ but the ectropion effect of the out-rolled mucosa is not shown.

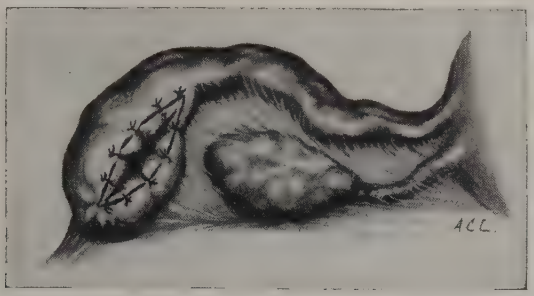


Fig. 5933.—Lateral Salpingostomy by Axial Incision _ Followed by Salpingorrhaphy; _ The opening in the tube being made upon that aspect of it which is in nearest relationship with the ovary.

Salpingostomy by Oblique Terminal Division of the Tube _ Followed by Salpingorrhaphy _ and Then by Salpingo-ovario-syndesis _ Clado.—The steps here are precisely the same as those just described _ up to the completion of the suturing of the margins of the tubal mucosa to the margins of the tubal serosa. And then, to insure contact of the new ostium with the surface of the ovary, the margins of this ostium are additionally sutured to the surface of the ovary _ in such manner as to bring tubal serosa and ovarian serosa into contact for union (Fig. 5932).

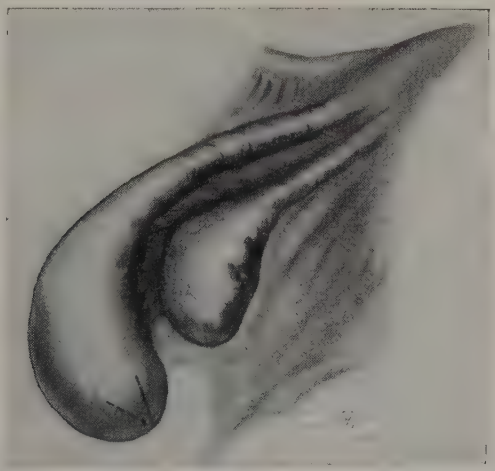


Fig. 5934.—Lateral, or Terminal Salpingostomy by a Flap Opening _ Followed by the Suturing of the Reversed Flap to the Tube _ Skutsch, I; _ An angular incision is made in the terminolateral aspect of the occluded tube to form the flap.

Lateral Salpingostomy by Axial Incision _ Followed by Salpingorrhaphy.—Instead of making the artificial opening in the tube terminal, it is sometimes made upon its lateral aspect _ and this may be particularly indicated in a case where such an opening would come into more convenient relationship with the ovary than would a terminal opening _ as where an ovary

might be adherent in some unnatural position or relationship – or where the ovarian ligament is unusually short. The technic is shown in Fig. 5933. To prevent the usual tendency to the closure of the ostium an excess of tubal mucosa is drawn out and sutured to the peritoneal margins.

Lateral or Terminal Salpingostomy by a Flap Opening – Followed by the Suturing of the Reversed Flap to the Tube – Skutsch.—Either a

Fig. 5935.—The Same – II; – The triangular flap has been turned back – and its margins sutured to the tubal serosa.

terminally or laterally placed opening, as may seem better adapted to the individual case, is made in the occluded fallopian tube – by making two limited incisions, meeting at a right angle, the apex of which points toward the distal end of the tube (Fig. 5934). This cut passes into the lumen of the

Fig. 5936.—Terminolateral Salpingostomy Following Partial Salpingectomy of the Outer Aspect of the Tube – and Followed by Oöphoropexy of the Ovary to the Adjacent Mesosalpinx.

tube – and the resulting triangular flap is turned outward, so that its serosa will come into contact with the serosa of the rest of the tube – to which its margins are sutured (Fig. 5935). The position of the new tubal opening is planned to be where its relationship with the ovary, in the special case, will best enable it to grasp the ovarian surface.

Terminolateral Salpingostomy Following Partial Salpingectomy of the Outer Aspect of the Tube — and Followed by Oöphoropexy of the Ovary to the Adjacent Mesosalpinx.—The distal end of the tube and more or less of the adjacent tube may have to be sacrificed. Following excision of this portion of the tube a terminolateral ostium is made by oblique section

Fig. 5937.—Uterosalpingostomy Following Partial Salpingectomy of the Inner Aspect of the Tube — I; — Excising the inner end of the tube and a transverse wedge-shaped section of the horn of the uterus.

of the remaining end of the tube — followed by suturing of the everted tubal mucosa to the margins of the adjacent peritoneum. The ovary is then so anchored to the mesosalpinx as to cause it to lie in closer proximity to the artificial opening of the shortened tube (Fig. 5936).

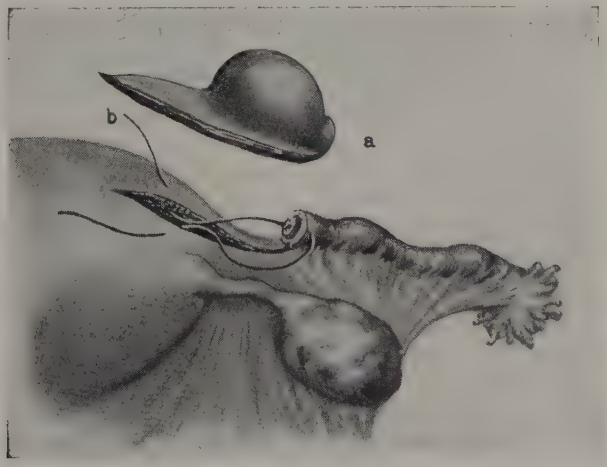


Fig. 5938.—The Same — II: — a, The excised portion; — b, the wound bed. A suture is shown passed through the wall (not the lumen) of the tube, and through the sides of uterine wound, from within outward — which, when tied, will bring the inner end of the tube into contact with the uterine ostium of the tube, and the opposite walls of the uterine wound into contact.

Uterosalpingostomy Following Partial Salpingectomy of the Inner Aspect of the Tube.—The cause of obstruction in the uterine tube may occur in the inner portion of the tube, or actually, though rarely, in its interstitial part, between the junction of the tube with the uterus, and the site of the internal ostium, upon the mucosal lining of the uterine cavity. A procedure

of somewhat greater magnitude than those forms of salpingostomy already mentioned may have to be undertaken. In Fig. 5937 is represented a cystic obstruction of the tube at its junction with the uterus. The technic here planned is to excise the inner aspect of the tube, including a section of the uterine horn, of elliptic outline on its surface, and wedge-shaped in its depth, with its axis corresponding with the direction of the uterine tubes. The appearance of the parts following this excision are seen in Fig. 5938. The reconstruction of the structures is now undertaken. A chromic catgut suture is carried through the wall of the proximal end of the fallopian tube, from serosa to serosa, but not penetrating the lumen – after which each end is carried into the uterine wound and out on to the uterine surface (v. Fig. 5938, **b**). When this stitch is drawn taut and tied across the wound it will not only draw the end of the uterine tube into the uterine wound, in contact with the original internal ostium of the tube, but it will approximate the sides of the uterine wound. When this stitch has been tied the rest of the wound is closed by ordinary interrupted sutures (Fig. 5939). For another method of accomplishing this end v. Fig. 5926, **b** and **c**, p. 558.

Fig. 5939.—The Same – III; – The margins of the wound are sutured together and to the serosa of the surrounded tube.

Comments.—In determining the patency of the fallopian tubes several points are to be borne in mind. First, the external ostium may not be demonstrable until its outer end is trimmed away – during which the tube is steadied by grasping its mesosalpinx. Next, when an attempt is made to probe the canal into the uterine cavity, it is to be remembered that even with the smallest probe only the outer part of the canal can usually be probed – the tube near the uterus and through the uterine wall is generally too small in caliber to admit of the passage of a probe without injury to the mucosa of the tube – Graves. (The Author would mention that he has successfully probed the ducts of the salivary glands with the probes Dentists use in probing the pulp canals of the teeth – and that these could probably be successfully used in probing the canals of the uterine tubes all the way through. Dental probes are made in three sizes.)

OPERATIONS UPON THE FALLOPIAN TUBES TO INTERRUPT THE CONTINUITY OF THEIR LUMINA – AND THEREBY PREVENT THE TRANSMISSIBILITY OF OVULES

Description.—Artificial sterilization of the female is sometimes called for – when it is unquestionably evident that pregnancy cannot be undertaken

without jeopardizing the physical welfare of the patient – and it is desirable to do so without depriving her of her ovaries. Various methods of interrupting the continuity of the uterine tubes – or of occluding their lumina, have been devised. But is it truly remarkable how many clever methods of technic have been defeated by nature – patency of the uterine tubes becoming re-established, followed by pregnancy, after some of the most apparently certain methods to prevent these occurrences have been reported, not occasionally, but in very many cases. Simple ligation has proved merely formal – and entirely useless – in many well authenticated cases – patulousness of the tract becoming restored. And continuity of the tract, or patulousness of the stump of the uterine end of the tract, has been established after combined ligation and partial excision of the uterine tube.

Crossen writes, – "When both tubes are removed, one or both uterine stumps may open and permit impregnation. The removal of both ovaries

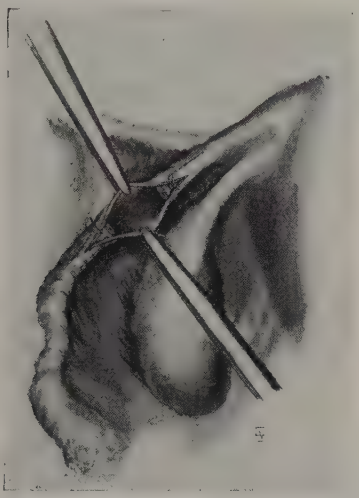


Fig. 5940.—Tubal Sterilization by Combined Partial Excision, Double Ligation, and Peritoneal Inversion Between the Ends – I; – The peritoneal covering of the tube has been axially split and retracted – the tube, within, doubly ligated – and excised between the ligatures.

Fig. 5941.—The Same – II; – The peritoneal covering has been inverted between the divided ends of the tube by Lembert stitches.

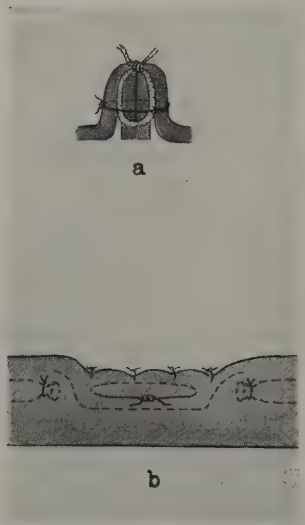
(supposed complete removal) is not a certain bar to impregnation, which fact is attested by numerous reported cases of pregnancy following double ovariotomy."

The Author is not cognizant of any absolutely positive method of producing artificial sterilization in the female – that may not be thwarted by nature – except through the unquestioned removal of all ovarian tissue – even if this implies that there may be supplementary ovaries, as there are supplementary thyreoid glands.

Some of the methods for artificial tubal sterilization will be here given:

Tubal Sterilization by Combined Partial Excision, Double Ligation, and Peritoneal Inversion Between the Ends.—The peritoneal covering of the fallopian tube is axially incised over the inner aspect of the tube and retracted to either side (Fig. 5940). From 2 to 2.5 cm. ($\frac{3}{4}$–1 inch) or more of the uterine tube is now included between two silk ligatures, tied within the peritoneal covering and bed of the tube – after which the intervening portion

of tube is excised and removed. The empty walls of the peritoneal covering of the tube are then inverted into the empty space between the divided ends so as to approximate their serous surfaces – this being accomplished by interrupted Lembert sutures, transversely placed (Fig. 5941). To further approxi-



Figs. 5942 and 5943.—The Same – III: – **a**, Transverse sectional view of the sutured wound, showing the Lembert stitching, above – and the axial, laterally placed stitch, below; – **b**, longitudinal view of the field, showing the ligated ends of the tube and the transverse and axial suturing.

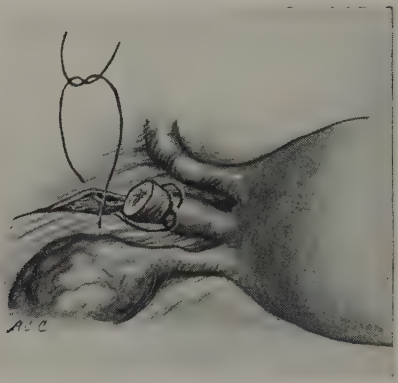


Fig. 5944.—Tubal Sterilization by Excision of the Outer Portion of the Tube and the Burial of the Ligated Inner Portion – I; – The outer part of the tube has been excised. The inner end has been ligated – and the long ends of the ligature carried into the wound, and then out through its sides, so that, when tied, the end of the tube will be buried beneath the surface of the wound.

mate the flaccid walls of inverted peritoneum an axially running suture is carried laterally through the approximated walls between the divided ends – this stitch being shown in Fig. 5942 – in transverse section, in **a** – and in axial section, in **b** (the transverse sutures being also seen in both planes).

Fig. 5945.—The Same – II; – The buried inner end of the ligated tube.

Tubal Sterilization by Excision of the Outer Portion of the Tube and the Burial of the Ligated Inner Portion.—The outer two-thirds or three-quarters of the tube are excised, and the wound through which the excision is made closed – just as described under Salpingectomy. The inner end of the tube is then sufficiently mobilized – circularly ligated – and the ends

of the ligature, left long, are carried through the margins of the adjacent wound, from within outward (Fig. 5944). When this suture is tied the free end of the tube is drawn down into the wound bed (Fig. 5945). This single burying-in suture may be reinforced by others.

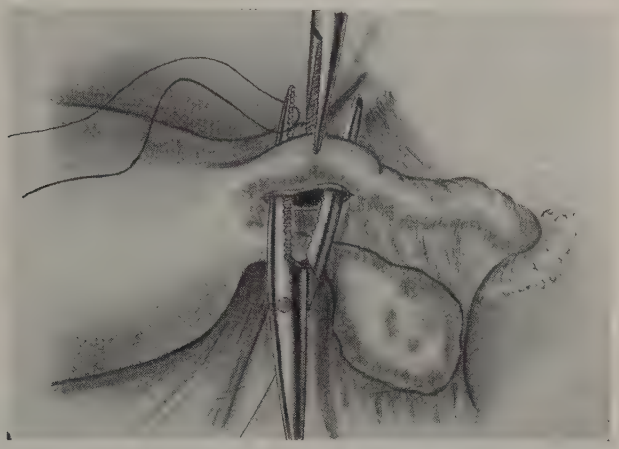


Fig. 5946.—Tubal Sterilization by Excision of the Inner Portion of the Tube and the Burial of the Ligated End of the Outer Portion – Crossen – I; – Mobilizing the tube near the uterus by penetration of the mesosalpinx with forceps – which are opened beneath its bed – and are then closed about a ligature, which is drawn backward under the tube, with which the distal end will be ligated – and the tube then divided.

Tubal Sterilization by Excision of the Inner Portion of the Tube and the Burial of the Ligated End of the Outer Portion – Crossen.—The uterine tube is grasped with forceps 1.3 cm. ($\frac{1}{2}$ inch) from the horn of the uterus – and, while the tube is lifted upward, a second pair of clamp forceps, with

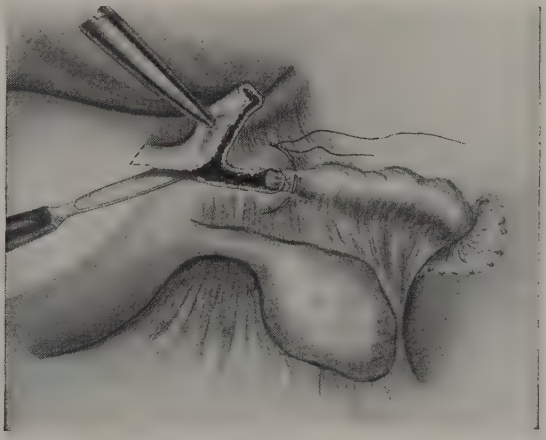


Fig. 5947.—The Same – II; – The ligated distal end of the tube is being buried by suture – and the freed inner end is being excised into the uterine wall.

rather sharp points, is thrust through the mesosalpinx, just beneath the tube. The second forceps are opened widely, tearing a free way beneath the tube (Fig. 5946) and then, closing, draws backward with it a ligature, which is tied around the distal end of the tube, and cut short – after which the tube

is divided proximal to the knot (Fig. 5947). The proximal end of the tube is excised into the uterine wall. Any bleeding vessels which are encountered

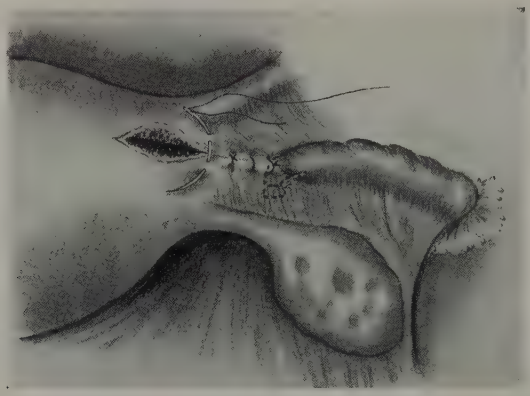


Fig. 5948.—The Same — III; — The closure of the wound.

are ligated. The wound is then closed by deep and superficial sutures — the outermost stitch burying in the distal end of the tube (Fig. 5948).

SALPINGECTOMY

Description.—The excision of the fallopian tube alone is often called for — usually in two sets of cases — involvement by tumors — and involvement by infection (usually gonorrheal) — and may be regarded in the sense of a conservative operation when its removal may be accomplished alone without the sacrifice of other structures, especially the ovaries.

The individual removal of the ovary has been given (v. p. 533) — and the conjoint removal of ovary and tube (v. p. 547).

The removal of the tube in non-infected and in infected cases will be separately considered.

Salpingectomy in Non-infected Cases.—These usually represent the simpler category of cases in which the removal of the tube is called for — because, in the majority of instances, of less involvement of neighboring structures. Exceptionally, however, complications and adhesions to adjacent organs may be as marked as in the case of pus-tubes.

In the total removal of the uterine tube the interstitial (intra-uterine) portion of the tube, as well as its fimbriated end, is included.

On opening the abdomen the hand is carried into contact with the posterior wall of the uterus — and is then swept outward and upward, over the upper, free portion of the broad ligament, where the fallopian tube is due to be found. A convenient method of manipulating is then to seize the fimbriated end of the tube with clamp forceps and the infundibulopelvic ligament with a clamp — the latter controlling the blood-vessels of the part (Fig. 5949). Putting these parts under slight tension — and at the same time separating them — the tube is excised with knife or scissors by cutting through its mesosalpinx — the section passing near to the tube, and avoiding the vessels as much as possible. This section may pass up to the horn of the uterus, and be there terminated by ligating the tube, and dividing it distally to the ligature — or, where the tube is to be excised in its entirety, the interstitial portion of the tube is excised by removing a wedge-shaped piece of the uterine horn. All bleeding vessels are clamped and then tied with fine chromic catgut. The uterine portion of the wound is then closed by buried and superficial sutures — and the wound

in the broad ligament, by interrupted or continuous catgut suturing, which approximates the margins of the peritoneum over the bed of the wound (Fig. 5950).

The procedure just described may be applied to both tubes.

Fig. 5949.—Abdominal Salpingectomy in Non-infected Cases _ I; _ The tube has been cut with scissors or knife from the free border of the broad ligament, severing its mesosalpinx _ after controlling its main blood-supply (ovarian artery) by clamping the free border of the infundibulopelvic ligament, **a**. A ligature, **b**, is placed around the tube at its entry into the uterine horn (but is not used as shown in the illustration, where a V-shaped excision of the cornu uteri is carried out); _ **c**, tractor ligature upon the cut, free borders of the broad ligament. (Figs. 5949 and 5950 modified from Bovée.)

Partial Excision of the Fallopian Tube.—This technic has been illustrated in connection with operations for preserving the transmissibility of the uterine tubes (v. p. 557). In removing part of a tube _ the outer portion being the part thus removed _ the above technic is applied to the part to be excised.

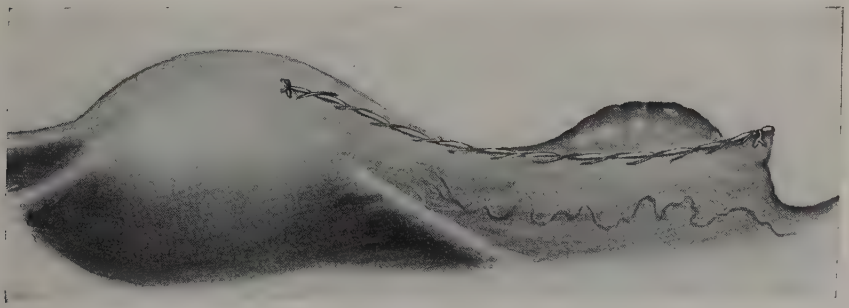


Fig. 5950.—The Same _ II; _ The sutured bed of the fallopian tube in the uterine horn and in the broad ligament.

Salpingectomy in Infected Cases.—These represent the most complicated type of this operation _ which, in difficult cases, sometimes assume the features of a major procedure. This is generally because of both the widespread and often dense adhesions which frequently accompany them _ and because of the infective nature of the cases and the ease with which infection

may be diffused, even with the most careful technic. While the removal of an uninfected tube may be a very simple affair – the removal of an infected one may be exceedingly complex.

The abdomen is opened in the usual manner – in the median line. The first step on retracting the walls of the wound is to determine, by visual and manual examination, the nature and degree of involvement – especially in the direction of adhesions of the tube or tubes to neighboring structures. The bearings of this aspect of the case are exactly the same as apply in the case of removing complicated ovarian cysts – and the technical detail of determining the intra-abdominal conditions and separating the adhesions the same – so that these details will not be again considered here (v. p. 536). The operation is begun in the horizontal position – and the patient is usually put into the Trendelenburg position while carrying out the details of the intra-abdominal work.

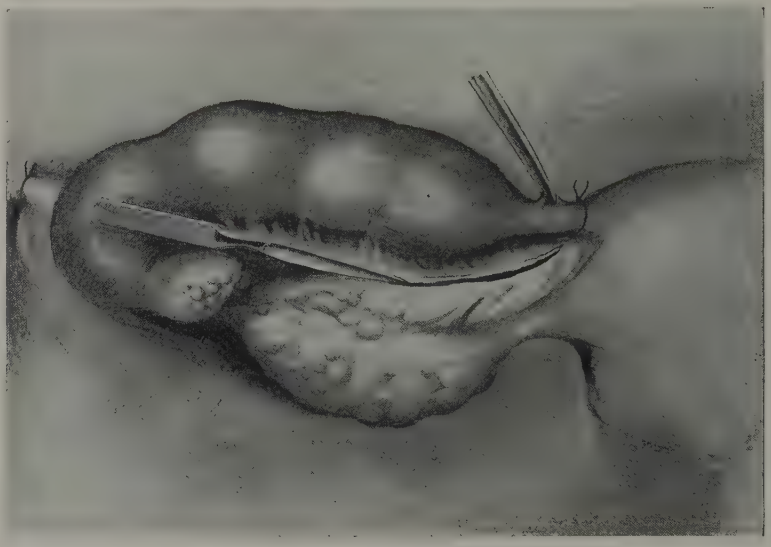


Fig. 5951.—The Removal of Pus-tubes; – The right distended tube is being severed from the broad ligament along its mesosalpinx.

The tube or tubes are usually considerably distended, and in proportion to the thinness of their walls is there dnager of bursting them and diffusing infection – especially so if, in addition to their distention, they are much bound down by adhesions – which, in chronic cases, are apt to be firm and resistant. It is decidedly desirable to remove the tube *en masse* without entering its cavity anywhere – and yet it is sometimes safer, in overdistended tubes, to introduce the needle of an aspirating apparatus and draw off part of the distending fluid before proceeding with the separation. When this is done, the needle opening in the wall of the tube is safely ligated (or clamped) – and disinfected as far as it is possible.

When all adhesions of the tube are freed (or of both tubes if involved) the tube is brought as far into the wound as possible and its surroundings packed off with gauze pads. The infundibulopelvic ligament is temporarily clamped, controlling the blood-supply from that quarter, and the mesosalpinx of the tube is seized by forceps – and while these tense and separate the parts, and the under packings of gauze guard the parts against possible mishap, the

more or less distended tube is dissected away from the broad ligament – from its fimbriated end to the cornu of the uterus (Fig. 5951). At the uterine

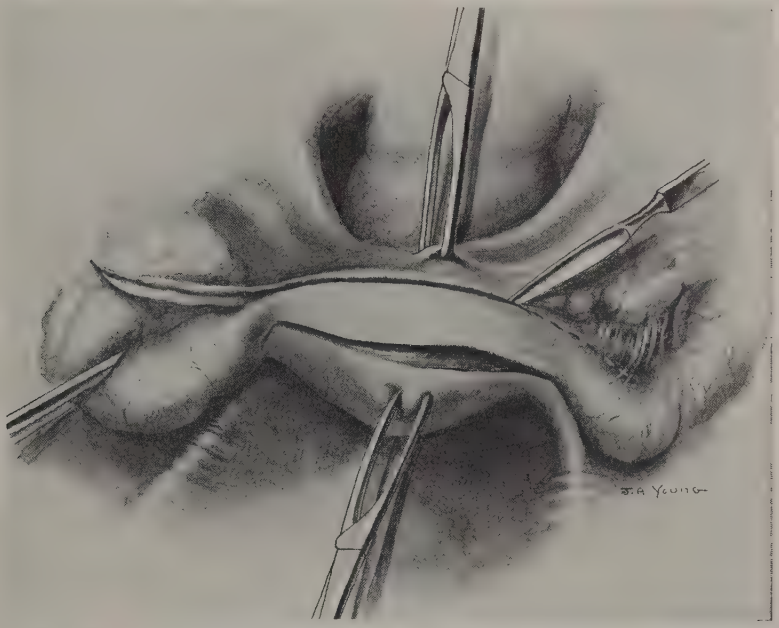


Fig. 5952.—Removal of Large Double Pus-tubes, Together with a Transverse, Wedge-shaped Section of the Fundus Uteri – Beuttner – I; – Excising both tubes and the uterine wedge.

horn the outer part of the interstitial portion of the uterine tube is excised in wedge-shaped manner – and the rest of the tube, into the uterine cavity,

Fig. 5953.—The Same – II; – The wound following the removal of the structures. Some of the sutures are placed.

cauterized with pure carbolic acid upon a fine applicator – which is much safer than simply ligating and dividing the tube at the cornu. All bleeding

vessels are caught and tied with chromic catgut. The wound in the cornu of the uterus is closed by buried and superficial sutures. And the margins of the peritoneal incision through which the tube was exposed are brought

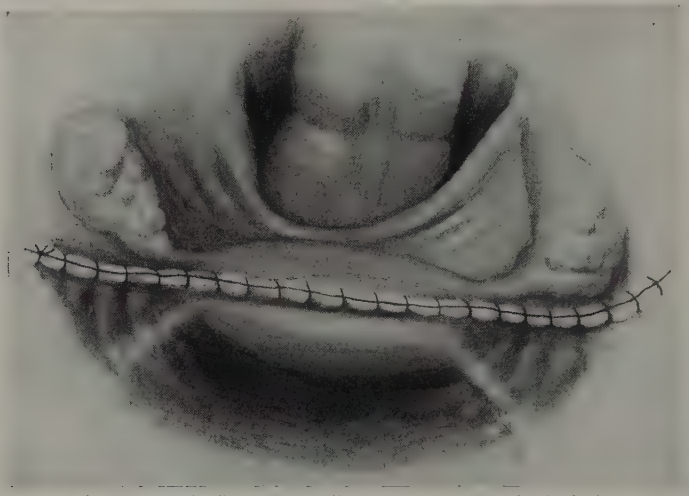


Fig. 5954.—The Same – III; – The sutured uterus and tube beds.

together over the wound bed by sutures. Drainage is ordinarily not indicated unless it is thought the wound has been infected.

Removal of Double Extensively Distended Pus-tubes, Together with a Transverse, Wedge-shaped Section of the Fundus Uteri –

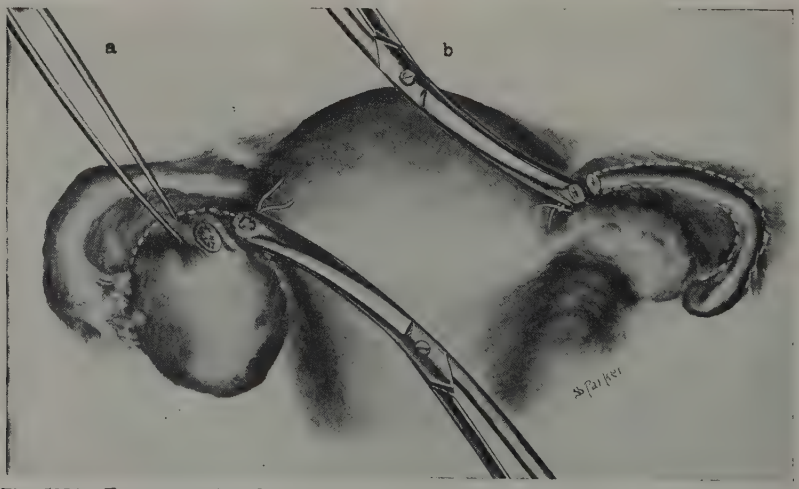


Fig. 5955.—Excision of One Ovary and an Opposite Tube: – a, Excision of the left cystic ovary – the utero-ovarian ligament has been ligated and divided by scissors, which continue to excise the ovary from its bed along the dotted lines; – b, similarly, the right diseased tube has been proximally ligated, and is being excised through its mesosalpinx along the dotted lines.

Beuttner.—This procedure probably represents the most extensive undertaking in connection with pus-tubes. A wide exposure of the pelvic cavity is required. Each individual tube, up to the cornu of the uterus, is freed exactly

as just described for the individual tube. A transversely placed, elliptic incision is then carried across the fundus of the uterus (Fig. 5952) the wedge-shaped piece of uterine tissue being comparatively narrow – including the interstitial portions of the uterine tubes at either cornu of the uterus – and passing directly into the cavity of the uterus. The appearance of the parts when this extensive excision has been completed is as seen in Fig. 5953 – and, when restored by deep and superficial suturing, as seen in Fig. 5954. Effort is made to save one or both ovaries.

Excision of One Ovary and an Opposite Tube.—On opening the abdomen a condition of affairs may be encountered in which it is indicated to excise the ovary of one side and the tube of the opposite side. Kelly reports such a case – in which, first, a normal pregnancy followed – and, next, an extra-uterine pregnancy. The ovary is excised along the general lines already given – Fig. 5955, **a** – (and also v. p. 533). And, similarly, the offending tube is excised in the usual manner (v. Fig. 5955, **b** – and also p. 568). Various theories have been advanced to explain the transmission of ovules in these cases – either that the remaining tube stretches across the pelvis and seizes the opposite ovary at the menstrual nisus – or that the escaping ovule migrates across the intervening distance to the fimbriated extremity of the opposite fallopian tube.

ABDOMINAL DRAINAGE OF THE FEMALE PELVIS IN INFECTION AND AFTER OPERATION

The general subject of the drainage of the peritoneal cavity, at large, has been given in text and illustration in Vol. IV, p. 207.

Fig. 5956.—Abdominal Drainage of the Recto-uterine Pouch by Means of a Perforated Rubber Tube.

Drainage of the pelvic peritoneal cavity by the vaginal route is described and illustrated under the operations upon the intraperitoneal female organs by the vaginal route (pp. 380–391).

Special drainage of the pelvic peritoneum by the abdominal route in connection with the intrapelvic female organs – or of drainage by the combined abdominal and vaginal routes – will, therefore, be but briefly given here.

Drainage may be called for – either because of diffused peritonitis – localized pus collections – or after operations, in connection with which infection is especially expected or feared – or where for any reason temporary drainage may seem indicated.

The drain which conducts fluid from the pelvic cavity by the abdominal route must, of necessity, pass to the bottom of the pelvic space, which is the recto-uterine pouch of Douglas' culdesac (Fig. 5956). This is a long distance

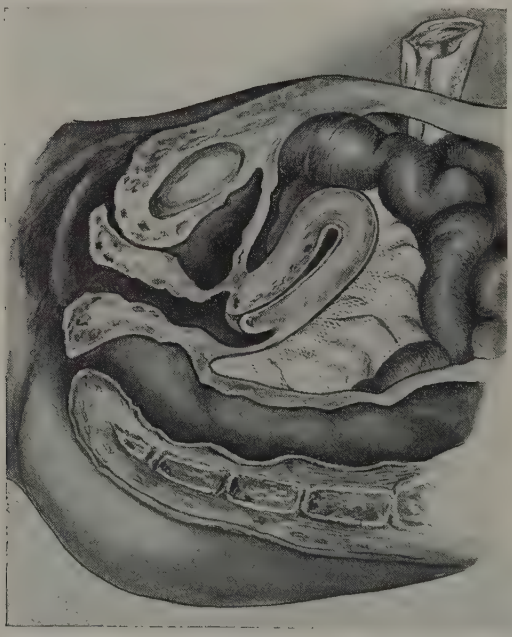


Fig. 5957.—Abdominal Drainage of the Recto-uterine Pouch and of the Pelvic Peritoneal Cavity by Means of a Gauze Drain.

from the outer surface of the suprapubic abdominal wall – and, besides, drainage must take place against gravity – that is, by capillarity and by intradominal pressure.

Drainage by the abdominal route is more indicated, in a general way, when the infection is more diffused throughout the planes of the pelvis – and vaginal drainage, when the infection is more localized to the immediate vicinity of the recto-uterine pouch.

The surface upon which an abdominal drain empties is freer of infection, and is capable of being kept freer of infection, than the cavity into which a vaginal drain empties – so that superimposed infection from the latter is bound to be more likely than from the former.

Vaginal drainage is, undoubtedly, greatly aided by gravity – especially if the patient be in the Fowler position.

No matter what form of drain be employed – but especially those in which

gauze enters as a part – the mechanics of drainage soon become largely interfered with by saturation or clogging – and the media through which drainage is accomplished must be changed to be effective – and this is more readily accomplished by the abdominal route.

A drain may pass through the posterior vaginal vault, into the tissues between the leaves of the broad ligament, without entering the free peritoneal space.

Hernia may follow abdominal drainage – and does not follow vaginal drainage.

Various forms of drain are employed – a split rubber tube, fenestrated, whose center is filled with a comparatively loose twist of gauze – would seem

Fig. 5958.—Mikulicz Bag for Mikulicz Drainage.

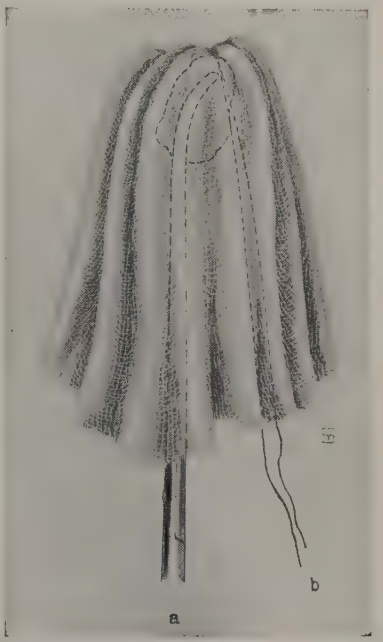


Fig. 5959.—Mikulicz Bag for Mikulicz Tampon Drain – II; – Method of inversion: – a, Long dressing forceps grasping knotted inverted end, with which to introduce bag to bottom of cavity; – b, free ends of knot ligature, by traction upon which the bag is ultimately loosened and withdrawn.

the best form of intraperitoneal drain – whether by the abdominal or by the vaginal route. Many other forms of drains are employed – such as plain gauze, plain rubber tubes, gauze surrounded by perforated or plain rubber tissues or cigarette drains made of gauze and perforated rubber tissue rolled into cigarette or cigar size, perforated glass tubes alone, or perforated glass tubes loosely filled with gauze, or tubes used in connection with suction drainage, and the like.

The meshes of all gauze drains soon clog (through lymph coagulation) – and the gauze must be renewed.

In using resistant forms of drain they must not press too constantly nor with too much force against any structure – lest pressure-necrosis result.

In using simple gauze drains they are not usually removed until about the fifth day – for fear of breaking down adhesions. But where the gauze is only the core of some tubal form of drain, it may be removed at any time – and should be removed and replaced as soon as it becomes inactive as a drain.

While lateral perforations of drains are, in one sense, an advantage, they are, in another a disadvantage – in that the intestines and omentum are apt to form tiny herniations through the perforations – making withdrawal painful and sometimes difficult. For this reason the position of the tube should be slightly changed constantly in rotation and elevation.

The method of carrying a rubber drain through the abdominal wall intc the bottom of the uterorectal pouch is shown in Fig. 5956.

A plain gauze drain of the same tract is seen in Fig. 5957.

Fig. 5960.—Mikulicz Bag for Mikulicz Tampon Drainage – III; – Two methods fo introducing strips of gauze into the Mikulicz bag in abdominal drainage of the pelvic cavity: – a, By means of long, curved dressing forceps; – b, by means of a gauze packer.

A Mikulicz bag drain was once much in vogue. The simple gauze bag, made as shown in Fig. 5958, and with tractor, for removal – is inverted in the manner seen in Fig. 5959, and carried into the deep pelvic cavity. This bag is then lightly packed with strips of gauze carried down through a gauze packer – or by ordinary long-bladed dressing forceps (Fig. 5960). It is subsequently removed by the tractor.

It is sometimes indicated to combine abdominal and vaginal drainage of the pelvic cavity – the former for the higher, and the latter for the deeper planes – as seen in Fig. 5961. When this is contemplated – and in all such operations the vagina should have been previously prepared for the emer-

gency – a pair of long, curved dressing forceps is introduced through the vagina – and against their partly separated blades projecting upward in the

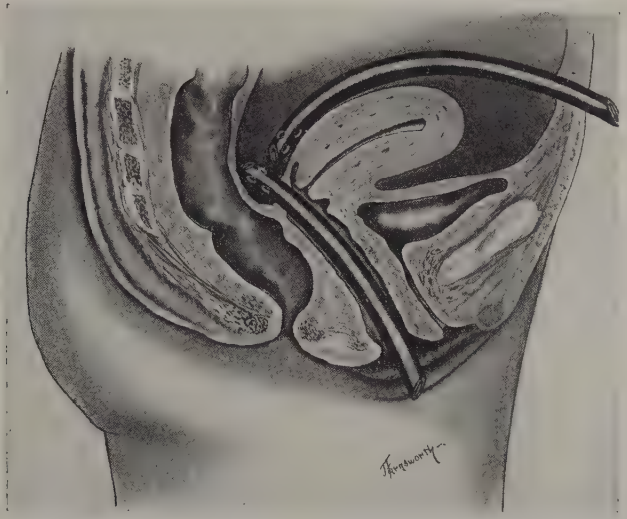


Fig. 5961.—Combined Abdominal Drainage of the General Pelvic Peritoneal Cavity – and Vaginal Drainage of the Recto-uterine Peritoneal Pouch.

recto-uterine pouch an incision is made between the tips of the blades (Fig. 5962), which are then carried through the vault of the vagina – and, seizing

Fig. 5962.—Instituting Vaginal Drainage of the Recto-uterine Peritoneal Pouch Through the Abdomen; – The blades of long, curved dressing forceps are introduced through the vagina, and opened against the uplifted floor of Douglas' culdesac – while a knife incises this floor between the blades. As the blades are withdrawn, they seize a rubber drain and draw it back through the vagina with them.

the rubber drain from within the abdomen, draw it downward through the vagina.

CHAPTER XCII

INTRA-ABDOMINAL OPERATIONS UPON THE UTERUS, ROUND LIGAMENTS, AND BROAD LIGAMENTS

Exposure of the female pelvic organs by the abdominal route, p. 578.

Operations for abscess between the folds of the broad ligaments encountered in intra-abdominal operations, p. 581; _ Operation for hematomata of the broad ligaments, p. 581; _ Operations for varicose veins of the broad ligaments, p. 581; _ Operation for infective thrombophlebitis of the utero-ovarian veins, p. 583; _ Excision of cysts of the broad ligaments, p. 585.

Operations for retrodisplacement of the uterus, in general, p. 587; _ Operation for retrodisplacement, compatible with pregnancy, by transperitoneomuscular transplantation and shortening of the round ligaments, by median abdominal section (Gilliam), p. 589; _ Operation for retrodisplacement, compatible with pregnancy, by subperitoneal transplantation of the round ligaments, their conduction through the abdominal wall, and anchorage upon the rectal aponeuroses through median abdominal section (Simpson), p. 599; _ Operation, compatible with pregnancy, by postuterine anchorage of the round ligaments, in "sling" fashion, through median abdominal section (Baldy-Webster), p. 602; _ Operation, compatible with pregnancy, by anterior plication and anchorage of the round and broad ligaments, p. 604; _ Operation, compatible with pregnancy, by posterior plication and anchorage of the broad ligaments (Venable), p. 606; _ Operation, compatible with pregnancy, by intra-abdominal shortening of the uterosacral ligaments, p. 607; _ Operation, incompatible with safe pregnancy, by round ligament fixation of the uterus to the abdominal wall (Olshausen), p. 609; _ Other forms of operation for uterine retrodisplacement, p. 612.

Posterior cuneohysterectomy for uterine anteflexion by the abdominal route (Thiriar), p. 623.

Abdominal operations for retroflexion of the uterus, p. 623.

Operation for uterine inversion by median hysterotomy through median abdominal section (Dobbin), p. 625.

Abdominal excision of uterine myomata, p. 625.

Abdominal hysterectomy, in general, p. 633; _ Abdominal supravaginal hysterectomy of the uterus transversely divided at the internal os excluding or including the appendages, p. 639; _ Abdominal supravaginal hysterectomy of the bisected uterus, excluding or including the appendages (Kelly), p. 649; _ Total abdominal hysterectomy with or without removal of the appendages, p. 656.

Abdominal hysteromyomectomy, p. 667.

Radical abdominal hysterectomy for malignancy, p. 679.

EXPOSURE OF THE FEMALE PELVIC ORGANS, BY THE ABDOMINAL ROUTE

The general technical procedures have been already considered _ for entering the abdominopelvic cavity _ and will not be gone into here in detail.

The most generally applicable method employed is the median abdominal section _ which has been described at length in Vol. IV, pp. 91–110.

The Pfannenstiel transversely curved, suprapubic incision, low or high, is frequently employed, especially by some Surgeons _ and particularly in cases requiring only a moderate amount of manipulative room _ and in cases where scarring is particularly distasteful. This technic has been fully described and pictured in Vol. IV, pp. 131–132. Its general method of performance is expressed cursorily in Figs. 5964 and 5965.

The Trendelenburg position (Fig. 5966) is of marked value in most of these cases _ furnishing additional room for operative work by causing the intestines to gravitate toward the diaphragm.

Convenient forms of the lighter type of abdominal retractors serviceable in this region and for these cases are pictured in Figs. 5967 and 5968. Heavier types of retractors are shown in connection with the description of the abdominal sections (Vol. IV, pp. 105–107).

Fig. 5964.—Exposure of the Abdominopelvic Cavity by the High Pfannenstiel Incision – in the Trendelenburg Position – I: – **a**, Retracting the lower lip of the curved incision, exposing the aponeurosis of the recti muscles; – **b**, dividing, axially, the attachment of the inner aspect of the rectal sheaths from the underlying musculature at the ineal alba; – **c**, fingers retracting rectal aponeuroses from the recti muscles.

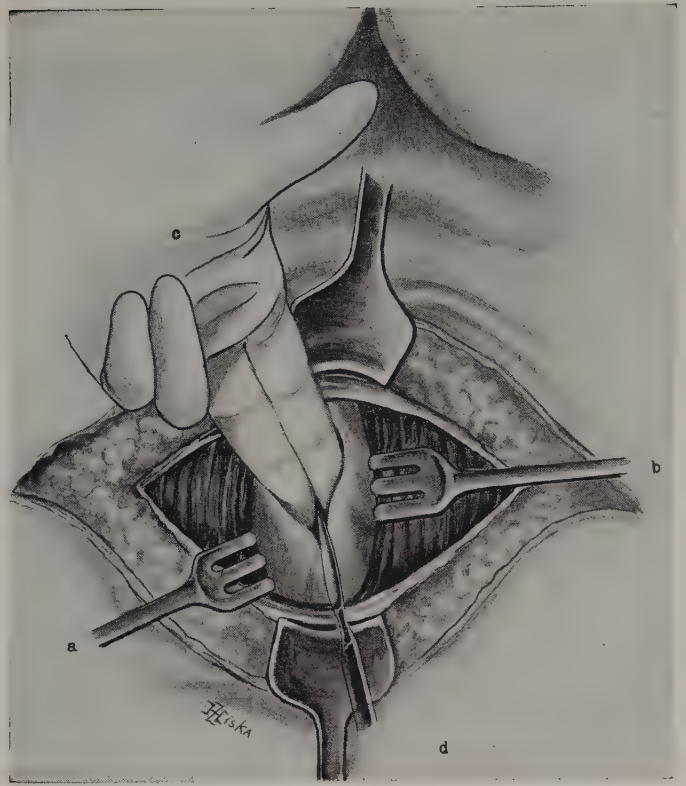


Fig. 5965.—The Same – II; – Incising the peritoneum, **d**, between two fingers, **c**, as a guide; – **a** and **b**, retractors of the recti and pyramidales.

Fig. 5966.—Trendelenburg Position.

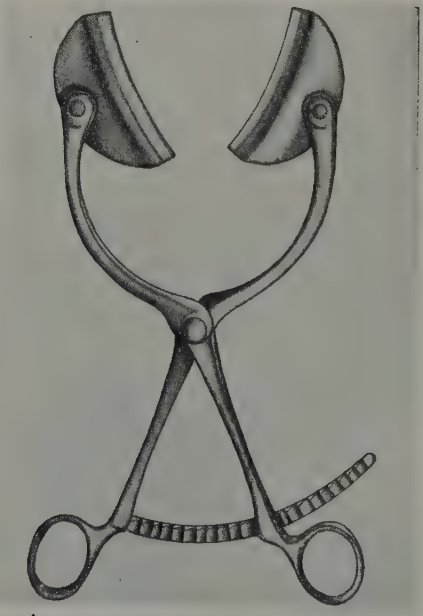


Fig. 5967.—Automatic Abdominal Retractor. (Redrawn from Döderdein and Krönig.)

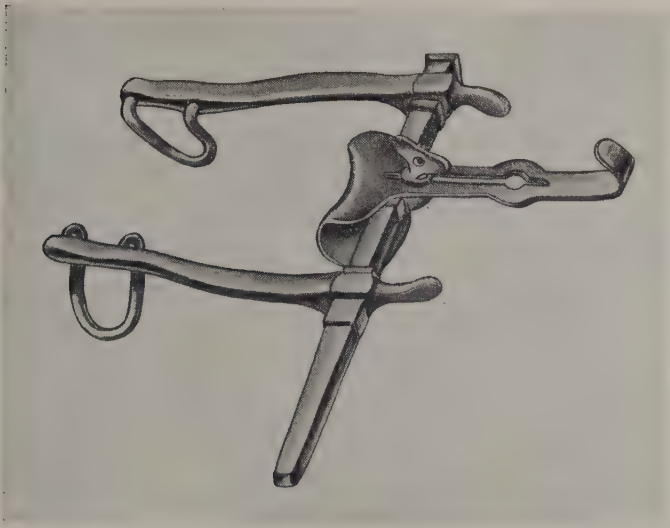


Fig. 5968.—Collin's Automatic Abdominal Retractor.

OPERATION FOR ABSCESS BETWEEN THE FOLDS OF THE BROAD LIGAMENT ENCOUNTERED IN INTRA-ABDOMINAL OPERATION

The best method of draining abscesses which occur between the layers of the broad ligament which are accessible to drainage by this route – which they usually are, is through the vagina by an opening made from within the vagina in the uterorectal peritoneal pouch. This is the method pursued when the abscesses are recognized and approached, from the start, through a posterior vaginoperitoneal incision. But when they are not known to exist and are only discovered during the progress of an intra-abdominal operation, the vaginal route of drainage still remains the preferable one – and, with the guidance gotten through an opened abdominal cavity, it is comparatively easy, under digital safeguarding through the abdomen, to incise the posterior vaginal fornix from within the vagina, preferably with sharp-pointed scissors – and then guide a blunt dissector, with the fingers within the abdomen, between the layers of the broad ligament, to the site of suppuration – and, after liberating the pus, to install a rubber-tube drain from the focus of pus out through the opening in the vaginal fornix. In this way the peritoneal cavity is spared being directly exposed to infection.

OPERATION FOR HEMATOMA OF THE BROAD LIGAMENTS

If an active bleeding into the folds of the broad ligament occur and be continuing – or if a hematoma be encountered in the course of an intra-abdominal operation – it may be indicated to expose and control the source of bleeding. This is accomplished by making an incision over that portion of the broad ligament containing the escaped blood – turning out the clot – ligating the broken or still bleeding vessel – and suturing the incised peritoneum.

OPERATIONS FOR VARICOSE VEINS OF THE BROAD LIGAMENTS

Description.—The condition of varices of the broad ligaments undoubtedly explained many of the ill feelings corresponding with those in men from

varicocele, before the connection of these enlarged veins of the pampiniform plexus was recognized as a cause of such bad, weighty, dragging sensations. It is now considered by a number of Surgeons that many of the pains often heretofore associated with displacements of the uterus are due to these varicosities which the displacement may have caused. They are probably largely due to long-maintained obstructed venous return during pregnancy, the congestion of the pelvic structures due to uterine displacement, constipation, inactivity, luxurious life, excessive sexuality, and the like.

This condition is relieved by the ligation or excision, or both combined, of the offending veins, as practised upon corresponding conditions elsewhere. It is the ovarian veins which are usually involved.

Operation for Varicose Veins of the Broad Ligaments by Multiple Ligations.—This may be regarded as the simplest type of procedure which may be applied to these cases. The broad ligament is exposed – that face of it, usually the anterior, upon which the venous enlargements and clusters are the larger – and, while steadying the part between the fingers, ligatures are passed beneath the most prominent veins, ligating them in sections (Fig.

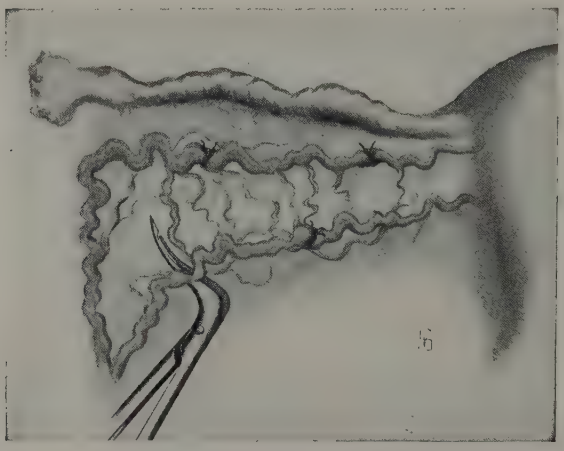


Fig. 5969.—Operation for Varicose Veins of the Broad Ligaments by Individual Ligation of the Unexposed Veins.

5969). No cutting of the broad ligament structures is required. The best instrument with which to make these multiple ligatures is undoubtedly the Reverdin needle (the blunter Cleaveland ligature carrier is shown in the picture). This method acts by obliterating the vessels in certain places – which causes ultimate shrinkage in the adjacent veins.

Operation for Varicose Veins of the Broad Ligaments by Combined Ligation and Excision.—This is a more radical measure than the one last mentioned and more apt to be satisfactory – as well as somewhat more of a surgical step. One of two methods of accomplishing this may be employed. After exposing the cluster of varicose veins a ligature may be conducted by means of a Reverdin needle beneath each end of the cluster – just as, in the last method, it was conducted beneath each of the large individual veins – and, here, tied *en masse*. The intervening mass of veins is then picked up with forceps and excised with curved scissors (Fig. 5970). In the raw bed thus opened up it may be necessary to ligate one or more vessels which, entering the area from the sides, have been cut. Finally, the opposite margins of the wound are brought together (Fig. 5971).

A somewhat more surgical procedure, as well as more difficult, is to deliberately expose the clusters of veins by an incision made over them or by

Fig. 5970.—Operation for Varicose Veins of the Broad Ligaments by Ligation, En Masse, of the Unexposed Veins _ I; _ Passing the two end ligatures through the serosa and under the veins _ and between these the varicosed veins will be excised.

the excision of an elliptic piece of mucosa over them _ and then _ after clearly defining the two ends of the cluster, pass a ligature around each end _ and then

Fig. 5971.—The Same _ II; _ Suturing the peritoneal margins together over the raw bed _ infolding, at the same time, the two end ligatures.

excise the veins between the ligatures _ and close the margins of the wound by suture over the bed and the ligatures.

OPERATION FOR INFECTIVE THROMBOPHLEBITIS OF THE UTERO-OVARIAN VEINS

Description.—Infective thrombophlebitis of the veins of the broad ligaments usually occurs in connection with a preceeding labor or abortion. The veins most frequently involved are the ovarian, which, corresponding with the spermatic in the male, pass from the ovaries, between the layers of the broad ligaments, to form the pampiniform plexuses of the two sides.

From each plexus two veins, accompanying the ovarian artery, course in front of the external iliac artery, and thence upward, posterior to the peritoneum, and anterior to the psoas muscle and ureter. The right veins pass behind the end of the ileum and the third portion of the duodenum. The left veins pass near the pelvic brim behind the beginning of the pelvic colon. The two right veins, uniting, enter the vena cava – and the two left veins, uniting, enter the left renal vein. The uterine veins, communicating above with the ovarian, and below with the vaginal, form the uterine plexuses within the inner aspect of the bases of the broad ligaments – and pass, thence, backward with the uterine arteries, in a peritoneal fold, on each side, which lies between

Fig. 5972.—Operation for Infective Thrombophlebitis of the Ovarian Veins; – The two right ovarian veins and some of their plexiform branches have been exposed – and are being ligated above the brim of the pelvis and near the uterus – prior to excising the portion between.

the back of the broad ligament and the recto-uterine fold – thence running, in the floor of the ovarian fossa, to end in the internal iliac vein.

In order to forestall the spread of septic thrombophlebitis it is sometimes indicated to ligate the trunks of the veins safely to the cardiac side of the site of involvement and then excise the infected veins, between ligatures – and promptly before the diffusion becomes general. The center of distribution is from the site of placental implantation, which is usually in the upper part of the uterus – and hence the more usual involvement of the ovarian veins. When the placenta is attached low in the uterus, the uterine veins are more apt to be involved. The ovarian veins are, of course, more accessible to ex-

posure than are the uterine – and, fortunately, they are the ones most frequently involved, for the reason mentioned above.

Operation.—Owing to the prominence of the thrombosed veins, their position is usually readily defined on exposing the region. The peritoneum is carefully divided over the prominent veins – remembering that their contents which, it is hoped, remain clotted, are infective. The involved veins are then dissected from their beds – being most careful, before doing much handling, to expose and ligate, in a region where the blood is still fluid, the veins between the site of thrombosis and the heart, so that further handling will not throw infected material into the general system. When the veins are well freed the involved portion of them is ligated by as many ligatures as may be indicated at their two extreme ends – and then the vessels are excised between the ligatures (Fig. 5972). The margins of the divided peritoneum are sutured over the bed of the wound. Temporary draining of the pelvic peritoneal cavity may be indicated.

The ovarian veins of both sides may have to be similarly treated.

The uterus itself is sometimes also excised supravaginally – especially if the uterine veins be involved.

EXCISION OF CYSTS OF THE BROAD LIGAMENTS

Description.—By broad ligament cysts are meant cystic tumors which grow between the two layers of the broad ligament, and separate these layers in their progressive growth.

Parovarian cysts are special forms of broad ligament cysts – arising from the parovarium, or the organ of Rosenmüller (remains of the nephros).

The removal of these tumors, if of moderate size and without complications, may often be accomplished so conservatively that the adjacent important structures, especially the ovary and tube, are preserved. If, on the other hand, they be large or complicated, and especially if both, their removal may become a considerable affair – involving sometimes the sacrifice of the adjacent ovary or tube, or both. In these latter cases the operation may amount, in difficulties, and present the general features incurred in the removal of large adherent ovarian cysts.

Operation.—It will be supposed that an intraligamentous cyst of the broad ligament, situated between the round ligament and the fallopian tube, is being removed. If the tumor be of any size, one or more of these structures is apt to be plastered, as it were, against its side – the tumor usually presenting a clearer field of attack between the ovary and tube, or between the tube and round ligament – or may be placed so far outward upon the ligament as to lie comparatively unfettered by other structures nearer the uterus.

An incision is made through the peritoneum directly over the prominence of the tumor – selecting a site as little vascular as possible, and where the least damage will be done to adjacent structures. This cut passes directly down upon the tumor – but most carefully avoids passing through its wall – as, apart from the unpleasantness of rupturing the tumor, and its possible consequence, it would then become distinctly more difficult to remove the collapsed walls of the cyst than when one has the distended tumor to work against. As soon as the wall of the tumor is reached the margins of the peritoneal covering are seized with opposite clamp forceps – and, while these walls are gently drawn aside, the tumor is carefully enucleated – by means of such an instrument as a curved blunt dissector – or, if occasional scissor snipping be required, by curved, blunt-pointed scissors, especially of the Mayo type (Fig. 5973). The cleavage line between the tumor wall and its surround-

ings is at once sought – and henceforth closely kept by hugging the cyst wall with the concavity of the scissors – until the final attachments are separated

Fig. 5973.—Enucleation of a Cyst of the Broad Ligament – I; – The peritoneum has been incised over the cyst – and curved, blunt-pointed scissors are enucleating the tumor from its bed.

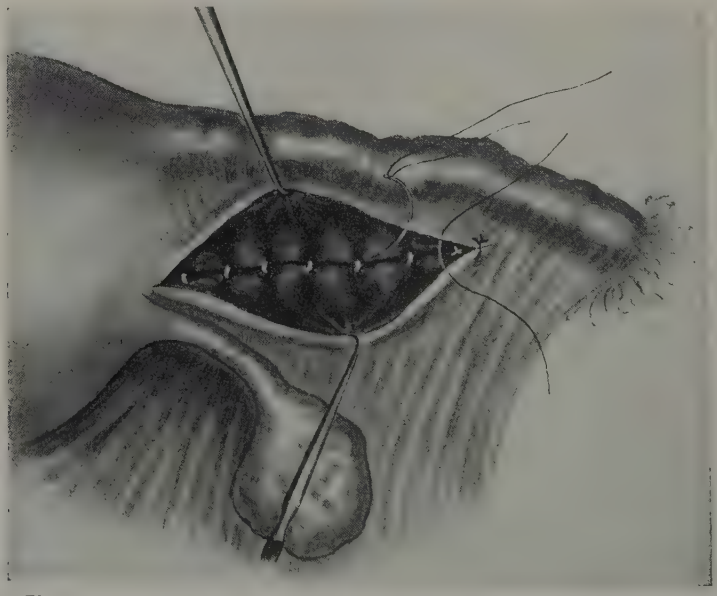


Fig. 5974.—The Same – II; – Closing the bed of the tumor by buried sutures – and the peritoneal edges by marginal stitches.

or clipped. If the tumor have a pedicle, this is ligated with chromic catgut. The bed of the tumor is then sponged dry – and any bleeding vessels encountered are tied with fine catgut. Finally, the opposite walls of the tumor

are brought together by buried catgut sutures _ and the margins of the peritoneum by marginal stitches (Fig. 5974).

Comments.—Sometimes a cystic tumor of the broad ligament in complicated cases involving neighboring structures by adhesions, and otherwise, cannot be so ideally shelled from its bed _ but must be removed by some type of converging incisions, which pass into and partly sacrifice these adjacent

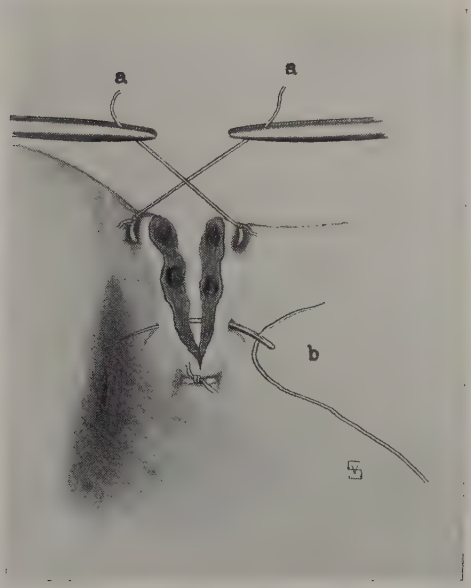


Fig. 5975.—Excision of Broad Ligament or Ovarian Cyst So Involving Adjacent Structures That They Must Be Partly Sacrificed by Converging Incisions _ after which the more important neighboring structures may be repaired by suture or ligated _ and the margins of incision brought together by sutures. The fallopian tube is shown ligated, and the ligatures being tied together _ while the margins of the underlying broad ligament, including the ovarian ligament, are being united by simple suture.

structures as well _ as shown in Fig. 5975 _ the margins of which, after ligation, are brought together by sutures.

OPERATIONS FOR RETRODISPLACEMENTS OF THE UTERUS, IN GENERAL

Operative measures which are employed for retrodisplacement of the uterus are groupable, insofar as the avenues of approach are concerned, into _ Operations by the vaginal route (which have been described on pages 368–507) _ Operations by the inguinal routes (described on pages 508–519) _ and Operations by the abdominal route, which follow.

Speaking in general terms, operations for the correction of uterine retrodisplacements performed by the abdominal route are of infinitely greater scope than are those performed by any of the other routes _ in that they make possible, first, the *definite* determination of *all* of the intrapelvic conditions present in the case, both those primarily and those contributorily involved _ second, they better enable the satisfactory carrying out of the indications which may be considered secondary in importance, but which are often, really, very major considerations _ and, third, in the opinion of the Author, a better quality of work, technically, can be performed through the opened abdomen, whether it is to cover one field or more than one field.

Unquestionably, the majority of operations which are susceptible of being performed upon the supravaginal uterus for retrodisplacements by both the vaginal and abdominal routes can be better performed, in quality of work, by the abdominal route.

In all operations upon the uterus proper, many of the associated pathologic states are not capable of being fully known until the pelvic cavity is fully exposed – and yet these unknown and often unsuspected conditions are, frequently, the main contributors to the symptoms of the cases.

Cases of retrodisplacement of the uterus present a great variety of features – and the causes of the sufferings of the patients may be very various – and so the surgical measures for relief are not due to be along one hard-and-fast line – nor the type of operation of one caste – but the line of surgical action and the operative technic finally adopted should be the ones which the combined pathologic phenomena suggest as best for the individual case.

It is not natural to suppose that a hard-and-fast rule of action could be carried out – and it is easily imaginable how the most cleverly performed operation performed intra-abdominally, with ideal on-the-table results, might be wholly inefficient in itself, and even its otherwise share of contributory good be lost, unless one or more equally important operative procedures were carried out upon, for instance, a perineal support unable, unless repaired, to sustain the good work done within the abdomen.

Nor is it to be supposed that any one set of surgical procedures, such as only round ligament shortenings, or only uterine fixations, or any other pet operative entity, were the only ones, and applicable to all cases.

Gradually the less efficient methods are dropping into the background – and the really efficient methods are being found to be fewer, are coming to the foreground, and are being further perfected.

In conclusion, two observations of practical importance may be made: First, that in the average run of cases, where no special complications are present, two pathologic features are to be dealth with – uterine retrodisplacement – and prolapse (in some degree) – and that the symptoms to be corrected (and which are generally chiefly due to the latter condition) – both from the patient's subjective standpoint and from the Surgeon's objective and mechanic standpoint – are that the operative measure should accomplish the two-fold ends – uplift of the prolapsed organ – and forward replacement of the retroplaced organ.

Second, that, all in all, the best structures to depend upon for the accomplishment of these two ends are, logically, those with which nature provided the individual to subserve the function of maintaining uterine position – the natural ligaments of suspension, especially the round ligaments, and the broad ligaments – and the vaginoperineal floor of support.

A number of the most frequently employed methods of combating uterine retrodisplacement and prolapse performed through the abdominal route will be now given – with, generally, a few words of the salient features of indication.

It is necessary to bear in mind – and there may be even a legal status to this bearing – that an appropriate operation to adopt in the case of a retrodisplaced uterus beyond the child-bearing period may be absolutely contraindicated in a child-bearing woman – as the latter should not be exposed to the dangers which must accompany pregnancy in an unnaturally placed or bound-down uterus. The methods best adaptable to uteri which may be subjected to pregnancy are, naturally, the usage of those structures which physiologically undergo enlargement and elongation as parts of the accompanying hypertrophy of pregnancy – such as the round and broad ligaments.

The general features of preliminary preparation for operations for the

correction of uterine retrodisplacements by the abdominal route are the same as those for abdominal section in general. Additionally, the vaginal route should also always be prepared _ as often, unexpectedly, one is compelled to invade it.

OPERATION FOR UTERINE RETRODISPLACEMENT, COMPATIBLE WITH PREGNANCY _ BY TRANS-PERITONEO-MUSCULAR TRANSPLANTATION AND SHORTENING OF THE ROUND LIGAMENTS _ BY MEDIAN ABDOMINAL SECTION

GILLIAM

Description.—The round ligaments, surrounded and guided by temporary thread tractors, are drawn through the peritoneum, and the aponeurotic and

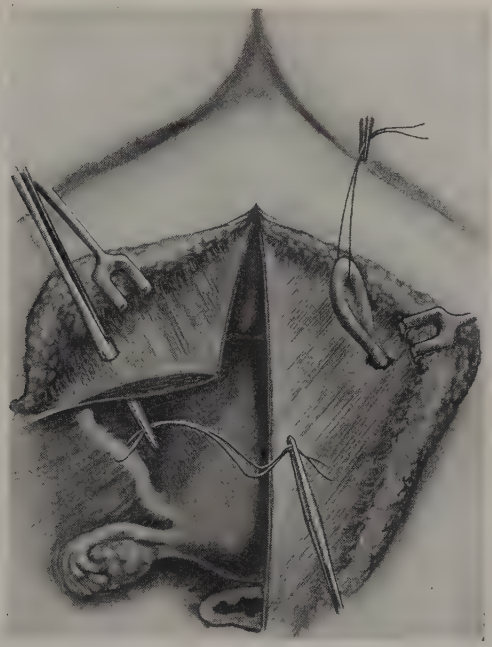


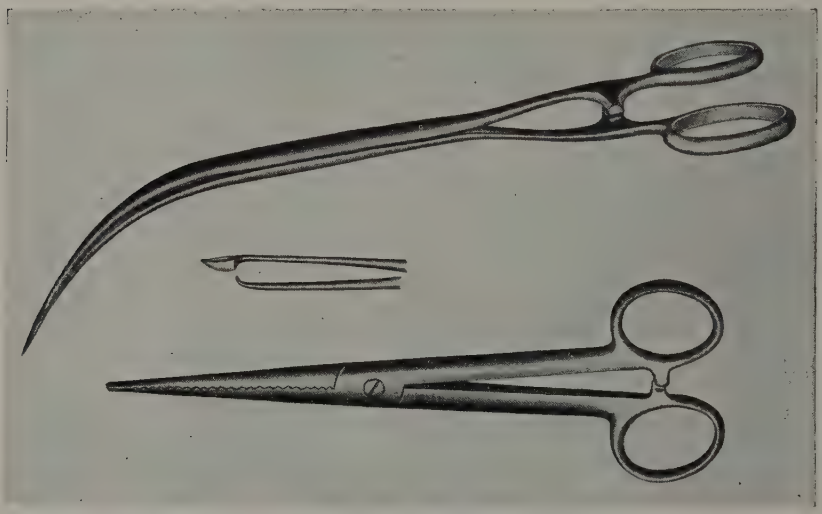
Fig. 5976.—Operation for Uterine Retrodisplacement Compatible with Pregnancy _ by Trans-peritoneo-muscular Transplantation and Shortening of the Round Ligaments _ by Median Abdominal Section _ Gilliam _ I; _ The abdomen has been opened in the median line _ the round ligament of each side has been surrounded by a temporary silk tractor _ and after dissecting back the skin and fascia, the left rectus muscle and sheath have been tunneled by sharp forceps, which are about to grasp the silk tractor and draw it and the loop of round ligament through the opening. The right ligament has been drawn through.

muscular portions of the two recti muscles through punctured openings _ drawing the uterus and its adnexa upward and forward after them _ and are anchored to each other and to the outer surfaces of the anterior aponeuroses of the recti between these and the connective tissue of the abdominal wall. The technic is, literally, a round ligament suspension of the uterus partly intra-abdominal and partly extra-abdominal.

This is the form of operation which in the judgment of the Author is the most effective and applicable to the greatest variety of cases, both within and beyond the child-bearing period, of the very many technical procedures employed and suggested for the correction of uterine retrodisplacement.

Operation.—The abdomen is opened in the median line _ and an examination of the intrapelvic contents made. If all be found favorable to the operation, the patient is tilted into the Trendelenburg position, to enable the intestines to fall backward and give manipulating room. Taking up in turn each round ligament with forceps, a fairly stout silk traction suture is passed beneath it by means of a Reverdin needle(an ordinary needle, Cleaveland ligature carrier, or the like) through the mesoligament. The distance from the horns of the uterus at which these traction sutures are placed will depend in part upon the extent of the displacement and the length to which the ligaments have been stretched _ but is usually about 3.7 cm. ($1\frac{1}{2}$ inches) distant from the cornua (Fig. 5976). These two temporary tractor sutures are clamped and dropped for the time.

The skin, superficial and deep fascia are freed by blunt dissection from the anterior aponeuroses of the two recti muscles to each side of the median section for a distance of about 1.6 cm. ($1\frac{1}{4}$ inches) outward, and held away by re-



Figs. 5977–5979.—Forms of Tunneling Forceps for Use in Penetrating the Abdominal Wall in Operations for Uterine Retrodisplacement: _ Gilliam's (above); _ Crossen's (below). (Modified from Crossen.)

tractors. At a point on each side about 3.7 cm. ($1\frac{1}{2}$ inches) above the pubic arch, and about 2.5 cm. (1 inch) from the edge of the incision a vertical puncture is made through the aponeurosis and muscular structure of the rectus abdominis of each side. Special forms of instrument have been devised for this purpose, such as shown in Figs. 5977–5979. A relatively sharp, slender ordinary artery clamp forceps is probably most frequently employed. When a more or less blunt instrument is used, it is well to make a limited incision through the anterior aponeurosis of the rectus muscle before penetrating the muscle _ and then to limitedly incise the peritoneum just at the point where the forceps is beginning to bulge into the abdomen. This latter is important, for a more or less blunt instrument is apt to separate these structures, especially the peritoneum, some distance from the abdominal wall before it tears its way through, and this is undesirable. Sometimes a narrow knife is carried all the way through the aponeurosis, the muscle, and the peritoneum. When this is not the case, and only the aponeurosis and peritoneum have been lim-

itedly incised, and the muscle itself tunneled by the forceps, then the final size of this opening is made by opening the blades of the forceps to the desired extent while they are *in situ* in the wound. The size of this abdominal opening on each side is of practical importance. It should be amply large not to constrict the round ligament, which, it is to be remembered, comes through double _ and at the same time it must not be large enough to serve as the initial step toward hernia, or a site into which a coil of intestine might get incarcerated. The smallness of the opening has been known to have so constricted the round ligament as to cause it to slough. Provision against this must be made, additionally, in view of the postoperative swelling of the parts _ both the contents of the opening, the round ligament, and the margins of the opening itself.

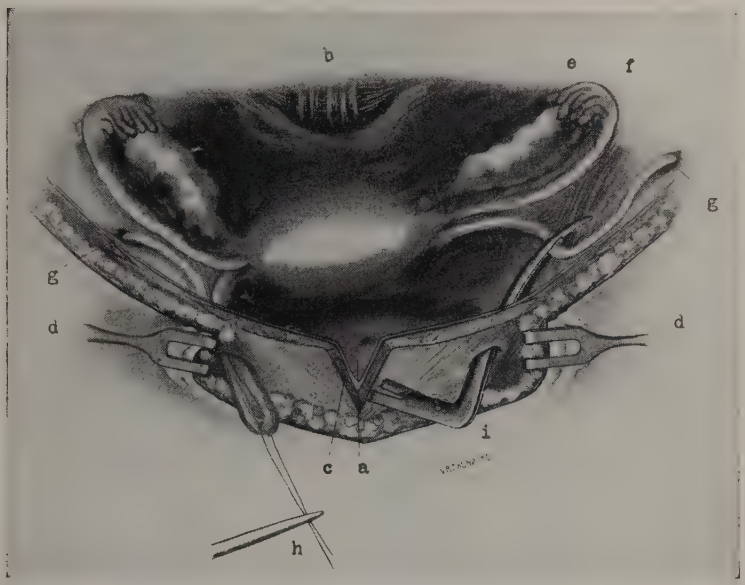


Fig. 5980.—The Same _ II; _ Drawing the round ligaments through the tunnelings in the abdominal wall: _ h, The right loop of round ligament has been drawn through the rectus and aponeurosis by means of a silk tractor; _ **i,** the right left loop is being drawn directly through by means of a Cleveland ligature carrier; _ **c,** median abdominal section; _ **d, d,** retracting the skin and fascia from over the inner two-thirds of the recti muscles; _ **g, g,** round ligaments leaving the abdominal cavity through the inguinal canals; _ **a,** bladder; _ **b,** rectum.

When all is in readiness the forceps or other instrument which have been carried through the abdominal wall now seizes the temporary tractor suture _ and draws it and the attached round ligament through the abdominal opening. When the ligament has been drawn partly through the opening it is well to cease further tension upon that side (Fig, 5980, **h**) and to bring forward the opposite round ligament to the same position. Then, seizing both round ligaments by theirt tractors, carefully draw the round ligaments further through the openings _ but *pari passu* with the lifting forward of the fundus of the uterus with the opposite hand within the abdomen _ so that at no time will the round ligaments be subjected to too much tension (for frail ligaments have been ruptured in this act). (In the illustration just quoted the left round ligament is being directly drawn through by the Cleaveland ligature carrier, which has both penetrated the abdominal wall and also the mesoligament.)

Between gentle and even traction upon the two round ligaments and hand reposition the uterus is brought into what is considered the position in which it is desired it should remain (Fig. 5981), remembering the tendency of the ligaments to lengthen somewhat under their new tension – that is, the backward displacement should probably be slightly overcorrected at the time of operation. It is a rather complex problem to make this calculation – for it must be made with the abdomen open, with all parts relaxed – as against the tightening up which must occur when the abdomen is closed.

The round ligament loops are usually drawn through until they can be sutured together in the median line (Fig. 5982).

Fig. 5981.—The Same – III; – Intra-abdominal view of the position of the uterus and its appendages following the completion of the operation.

Having secured sufficient length of loops, various methods of anchorage of the round ligaments to the abdominal wall have been carried out. Some Surgeons anchor each round ligament loop to the outer aspect of the abdominal opening and to the anterior rectal aponeurosis of its own side at once and independently – before closing the abdomen. This has probably the advantage of determining just how far the uterus has been drawn forward – but is not as satisfying as it seems, for the abdomen is still open. The Author has always closed the abdomen in the usual manner before anchoring the ronud ligaments. A compromise measure might be desirable – namely, to anchor the round ligaments at once to at least the extent of placing those sutures which hold them to the anterior rectal aponeurosis immediately at the point

of their exit through the tunneled opening – then close the abdominal wound – and, finally, complete the round ligament anchorage.

Different methods of anchoring the extra-abdominal loops of the round ligaments have also been employed – after closing the abdominal wall. The method the Writer has always pursued is shown in Fig. 5983. After drawing the loop of round ligament through each opening, the loop is spread out, and ample calculation is carefully made to carry out the following technic: – each limb is anchored by a silk suture passing through half the thickness of the round ligament and taking a firm hold upon the adjacent anterior aponeurosis of the rectus (Fig. 5983, **c, c**) – and then the ends of the loops are flattened

Fig. 5982.—The Same – IV; – Extra-abdominal anchorage of the round ligament loops. The abdomen has been closed – and the loops themselves have been sutured together in the middle line. These loops are further anchored to the rectal aponeuroses and muscles at as many sites, including their passages of exit, as may seem indicated (v. Figs. 5981 and 5983.)

out toward each other exactly in the median line, and are sutured together by three silk stitches, taking in half the thickness of each round ligament and thus approximating some length of round ligament to round ligament (v. Fig. 5983, **a**). Finally, the sides of the triangles thus formed are sutured to the rectal aponeuroses by stitches taking in only the half-thickness of the round ligaments (v. Fig. 5983, **b**).

Instead of bringing the round ligaments through peritoneum, posterior rectal sheath (or what there is, if any, of this sheath at this level of the abdomen), rectal muscle, and outer rectal sheath, or aponeurosis, the round ligament is made to emerge, externally, between the surface of the naked

rectus muscle and the retracted outer aponeurosis of the rectus – and is then conducted toward the median line, and anchored between the anterior surface

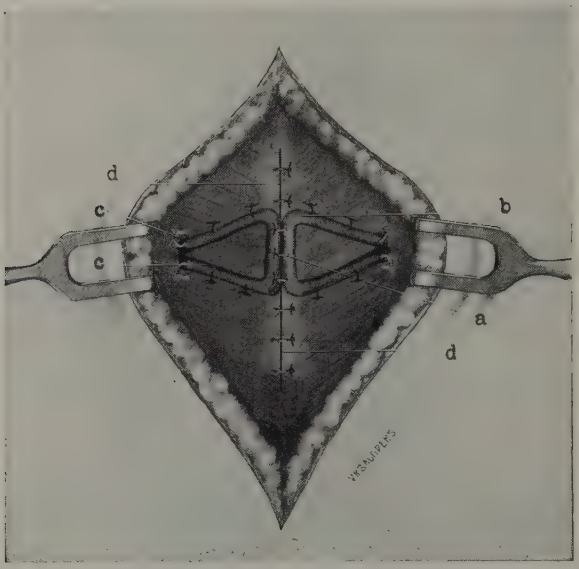


Fig. 5983.—The Same – V; – Suturing the loops of round ligament, after their delivery, directly to the outer surfaces of the rectal aponeuroses – to each other, in the median line – and to the margins of their external exits – each loop being given a triangular outline.

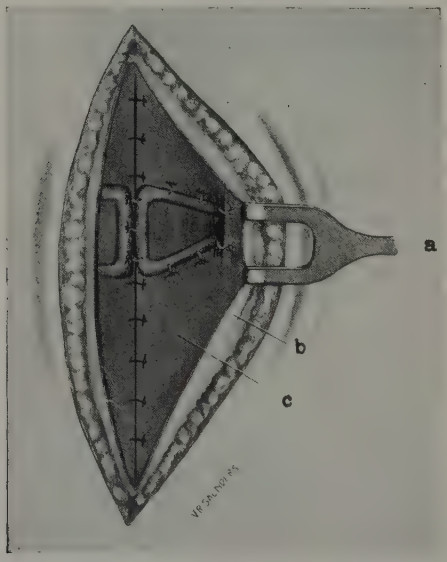


Fig. 5984.—The Same; – The round ligament loops may be sutured together and directly to the denuded recti muscles beneath the aponeuroses: a, Retractor of aponeurosis, b; – c, rectus muscle.

of the naked rectal muscle and its anterior sheath (Fig. 5984). All the rest of the steps in this procedure being the same as those just described.

Last of all, the skin and fascia are brought together by suture – the fascia, if thick, being closed by separate buried sutures of catgut – and the skin, by silkworm filament.

The intra-abdominal and sectional views of the complete operation are seen in Figs. 5980 and 5981.

Comments.—It is of practical importance that the entire circumference of the round ligaments should be nowhere included in a suture – for fear that subsequent swelling might result in sloughing of the ligament at this point.

It will be noticed that not only is the natural tension of the round ligaments shifted from a somewhat more lateral to a more direct anteroposterior pull – but that, additionally, some of the broad ligament is, of necessity, also drawn forward into the abdominal tunneled wound, which tends to a forward

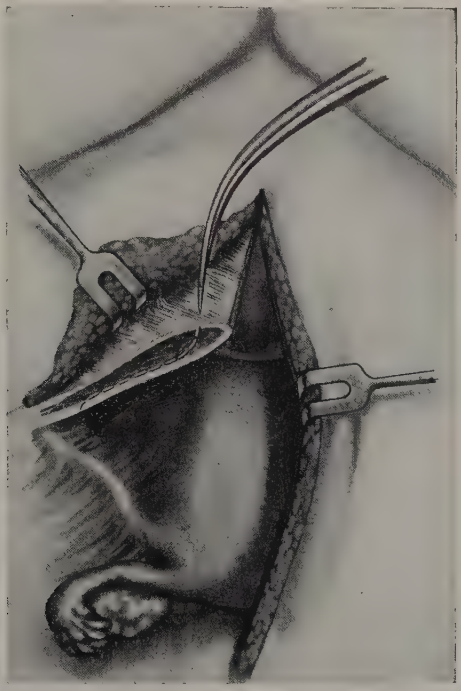


Fig. 5985.—Course of the Abdominal Wall Tunneling in Crossen's Modification of the Gilliam Retrodisplacement Operation.

uplift of the ovaries and tubes as well – and that, altogether, the structures employed are relatively strong and resistant.

When pregnancy occurs following this operation the round ligaments still within the abdomen undergo hypertrophy and subsequent involution, just as the uterus itself does.

An aspect of the above technic which has been pointed out as a weak part of it is that the free loop of loose round ligament, left between the natural passage of the round ligament from the abdominal cavity(that is, the internal opening of the inguinal canal), and the artificially made opening through the outer aspect of the rectus (v. Fig. 5982), is potential of danger in the sense of forming a possible source of intestinal obstruction. This is probably more of a possible than an actual danger – but, at any rate, it has been sought to obviate it in several ways. The free portion of the loop may be roughened and sutured

to the parietal peritoneum, thus obliterating the space between the loop and the abdominal wall.

In order to lessen the length of this loop between the inguinal canal and the artificial exit of the round ligament through the abdominal wall, Crossen, instead of bringing the round ligaments out directly (that is, vertically) through the outer thirds of the recti muscles, causes them to obliquely emerge through the same site of exit as in the method just described – but he obliquely tunnels the rest of their transit through the abdominal wall in the manner indicated in Fig. 5985. He also causes the round ligament loops to emerge and be anchored between the anterior surfaces of the recti muscles and their anterior sheath. To accomplish these ends he retracts the anterior sheath of the rectus muscle – then, depressing the bladder, he enters his special puncturing tenaculum forceps 2.5 cm. (1 inch) above the pubic bone, and the same distance from the edge of the wound, and carries it obliquely through the outer third of the rectus muscle until the subserous areolar plane is reached – and continues to travel in this plane, guided by a finger in the abdomen, beneath the position of the point of the instrument until a point is reached about 1.3 to 2.5 cm. ($\frac{1}{2}$–1 inch) mediad to the internal abdominal ring – where it is thrust through the peritoneum – after which the entire canal, thus made, is stretched by opening the blades – the round ligament is grasped and drawn through the abdominal wall. A minimum of free loop is thus left. The loop is then anchored upon the surface of the raw rectus muscle beneath (rather than on top of) the anterior muscular aponeurosis. This anchorage of the loop under the aponeurosis accomplishes the maximum toward lessening the sensitiveness some women sometimes complain of because of the anchorage of the round ligament above the aponeurosis –and which in thin-walled women may be decidedly uncomfortable, especially when subjected to pressure.

Instead of making the abdominal exposure through a median incision the Pfannenstiel incision is sometimes employed – the rest of the technic being as described above.

The epigastric vessels are always located before making the penetration of the abdominal wall on the two sides – so that complications may not be incurred by wounding or including these vessels.

Advantages should be taken of the opened abdomen to break down any adhesions which are encountered – and especially such as may tend to counteract the fullest benefit of the operative technic in hand.

Some Surgeons systematically remove the appendix in all relatively young women at the same time.

Also, as a matter of routine, some Operators suture that portion of the round ligament to the abdominal peritoneum which intervenes between the opening of the inguinal canal and the site of artificial tunneling of the abdominal wall – to do away with the potential danger of such a loop.

When the rectus muscle is tunneled its inner border is seized and the entire muscle of that side is drawn inward before making the penetration.

It is sought to penetrate the abdominal wall in the middle inguinal fossa, safely away from the epigastric vessels.

It is to be remembered that the uterus is not to be *drawn forward* by tugging upon the round ligaments after they have been delivered through the abdominal wall – but only to be *held forward* by them – after the uterus has been *lifted forward* by a *hand against the posterior aspect of the fundus*.

The fundus of the uterus must not be bound against the abdominal wall by the anchorage of the round ligaments, but must swing in the clear – nor must the fallopian tubes be imprisoned or twisted. The ovaries usually swing in the clear, posteriorly.

Some Surgeons not only neithger suture the round ligaments to the anterior surface of the anterior rectal aponeurosis _ nor to the anterior surface of the bared rectus muscle _ but suture the loops of the round ligaments to the under surface of the detached anterior rectal aponeurosis.

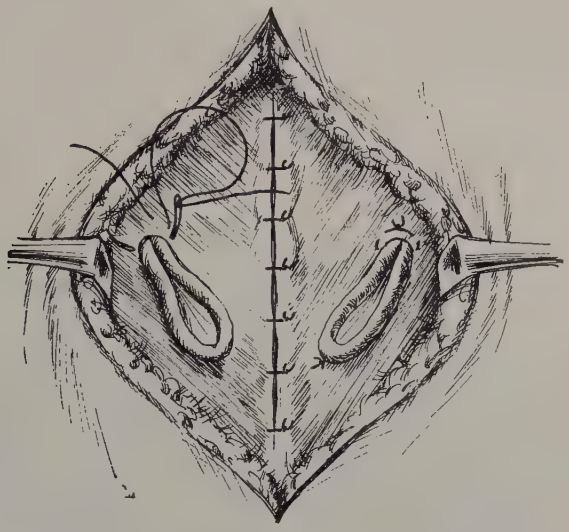


Fig. 5986.—Gilliam's Operation _ The Same; _ Anchoring each loop of round ligament individually to the outer surface of the rectal aponeurosis of its own side.

It will be observed that the strongest parts of the round ligaments are used in holding the uterus upward and forward _ while in the extra-abdominal shortening of the round ligaments (Alexander's operation) it is sometimes held

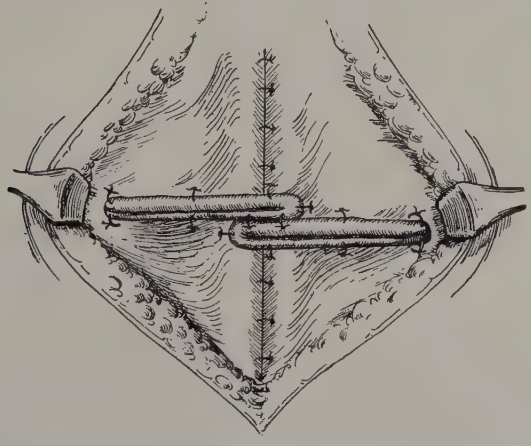


Fig. 5987.—Mayo's round ligament anchorage in Gilliam's operation; _ The round ligament loops are here made to cross the median line _ being sutured at the same time to each other and to the aponeuroses.

(though overstressed, probably) that the weakest parts of the round ligaments, if not finally employed, are at least used to draw the uterus forward, and that the uterus while drawn forward is actually drawn somewhat down-

ward. It is also held that hernia is less apt to occur in the present type of operation.

It is held by some Surgeons if the uterus forms adhesions between itself and the abdominal wall, danger and discomfort arise during pregnancy. If this be the case, it is rarely mentioned.

The round ligaments should certainly not be drawn together upon the front of the abdominal wall simply for the purpose of being able to suture them together in this position if it be evident that this degree of approximation is contraindicated in the special case, and the carrying out of which would subject the round ligaments to much tension, and approximate the fundus uteri too closely to the abdominal wall. The loops may be sutured to the outer abdominal aponeuroses wherever they conveniently lie (Fig. 5986).

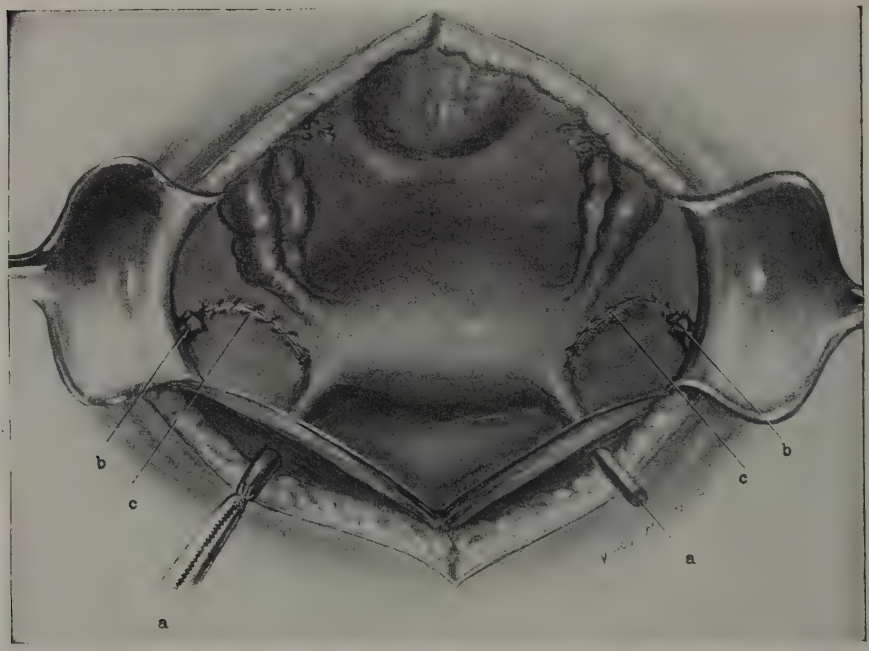


Fig. 5988.—Fergusson's Intra-abdominal Division and Trans-peritoneo-muscular Transplantation and Shortening of the Round Ligaments for Uterine Retrodisplacement: – a, a, The stumps of the proximal portions of the round ligaments, which have been divided at b, b, their beds, c, c, closed over by the sutured peritoneum, are being drawn through the punctured abdominal wall on either side of the median incision, to be anchored to the aponeurosis of the corresponding rectus muscle.

Mayo's modification of the Gilliam operation is very similar to Simpson's just described – the round ligaments being drawn out through the inguinal canals – and then are made to cross each other in the median line, and are anchored between aponeurosis and muscle (Fig. 5987).

Fergusson's trans-peritoneo-muscular transplantation and shortening of the round ligaments for retrodisplacement – which was the basis of the present Gilliam type of operation – the operation, indeed, often being very rightly called the Fergusson-Gilliam operation – differs from the later (Gilliam) operation, in that the round ligaments are divided at about 3.7 to 5 cm. ($1\frac{1}{2}$-2 inches) from the uterus. The peritoneum is then incised over their proximal ends, which are mobilized, and the peritoneum sutured over the empty beds of these proximal ends. The proximal ends of the round ligaments are then

brought through the abdominal wall in the same manner as in the Gilliam operation (Fig. 5988) and are sutured to the aponeurosis of each rectus muscle _ with the same closure of the abdominal wound and skin.

OPERATION FOR UTERINE RETRODISPLACEMENT, COMPATIBLE WITH PREGNANCY _ BY THE SUBPERITONEAL TRANSPLANTATION OF THE ROUND LIGAMENTS, THEIR CONDUCTION THROUGH THE ABDOMINAL WALL, AND ANCHORAGE UPON THE RECTAL APONEUROSES _ BY ABDOMINAL SECTION

SIMPSON

Description.—The essential difference between this and the Gilliam or Gilliam-Fergusson operation is that the loops of round ligaments, instead of being conducted through the free abdomen, leaving potential gaps for intestinal entanglement, are conducted subperitoneally from the uterine cornua to the internal abdominal rings, where they are brought through the abdominal wall, to be anchored upon the aponeuroses of the recti muscles.

Operation.—The fundamental idea in the operation _ that is, the subperitoneal conduction of the round ligaments through the abdominal cavity to avoid free loops within the cavity) is Simpson's. Other relatively secondary details in the manner of carrying out some of the steps of the operation have been suggested by C. H. Mayo, Noble, Mann, Ill, Montgomery, Graves, and probably others. The Simpson operation as here given follows the technic as carried out by Noble, with minor modifications of Mann and of Ill, which he follows.

The abdomen is opened by a right paramedian incision _ approximately 5 cm. (2 inches) long _ longer, if needed _ and any complications present rectified. The round ligaments are loosely surrounded by provisional ligatures, silk or catgut, at about 5 cm. (2 inches) from the uterine cornua (approximately one-third of the way from the cornua to the internal abdominal rings) (Fig. 5989). The round ligaments are then grasped with artery clamps midway between the provisional ligatures and the internal abdominal rings. The points of the round ligaments thus clamped are now sutured to the proximal parts of the round ligaments immediately at the uterine cornua by two silk or chromic catgut sutures at each cornua (Mann). By the technic thus far carried out the proximal two-thirds of the round ligaments are converted into loops, the middles of which are held by provisional ligatures carried through the mesoligaments. While outlining the position of the round ligaments by tensing them, limited incisions are made through the peritoneum of the broad ligament just below these ligaments, and near to the site where the limbs of the loops of round ligaments have been sutured to each other at the cornua. This incision is not more than 1 cm. (6/16 inch) in extent _ or a tear may be made that will admit the finger. The Surgeon, standing upon one side of the patient, now limitedly incises the sheath of the opposite rectus muscle, from which the cutaneofascial structures have been retracted, and proceeds to conduct a large type of curved aneurysm needle (a Cleaveland ligature carrier is shown in Fig. 5989) to the provisional loops around the round ligaments. The course of this passage is expressed by Noble as follows: _ "A blunt aneurysm needle is then passed between the aponeurosis of the external oblique (external sheath of the rectus) and the rectus muscle. The needle is passed under the sheath of the rectus to the outer border of the muscle. It then penetrates the rectus and passes beneath the peritoneum to the internal ring. The point of the needle is then made to follow the round ligament along the anterior face of the broad ligament to the rent in the peritoneum already described." In this description it is possible there is some confusion of terms _

though the oblique sweep of the transit through the full thickness of the abdominal aponeuromuscular thickness is evident. Having emerged into the peritoneal cavity through the incised opening beneath the round ligament, the provisional ligature is seized or threaded upon the aneurysm needle – and withdrawn through the canal in the reverse direction. Noble's description of this course is as follows: – "Traction upon the ligature causes the loop of round ligament to pass beneath the peritoneum, across the anterior face of the broad ligament to the internal ring, and then beneath the peritoneum of the anterior abdominal wall to the outer border of the rectus muscle, then

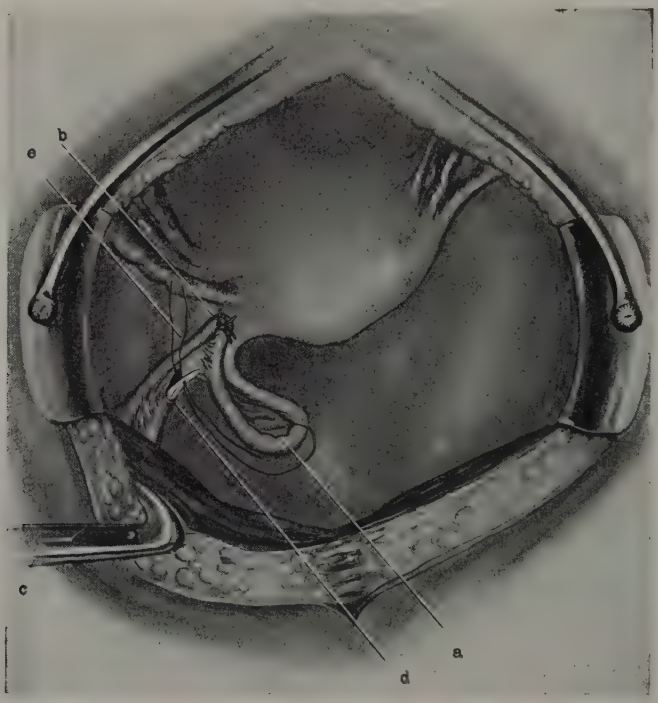


Fig. 5989.—Noble's Technic in Simpson's Modification of Gilliam's Uterine Retrodisplacement Operation – I: – a, Loop made of inner two-thirds of the round ligaments; – b, suture of round ligament at junctilon of middle and inner thirds to uterine cornua; – c, Cleveland ligature carrier conducted between external sheath of rectus and its muscle – thence outward and through rest of abdominal musculature opposite internal abdominal ring – thence along round ligament, under peritoneum, to opening, d, made in broad ligament beneath round ligament, near to the uterine cornua; – e, temporary ligature beneath loop of round ligament, by which the latter will be drawn, in reversed direction, through channel made by ligature carrier. See text. (Figs. 5989 and 5990 modified from Kelly and Noble.)

through the muscle and between it and the aponeurosis of the external oblique until it emerges in the abdominal incision." In making this transit care is to be exercised that the peritoneum be not dragged into the canal along with the round ligament. Finally, the loops of the round ligaments are sutured to the inferior aspect of the aponeuroses of the "external oblique" by two sutures (Ill) – although Noble's illustration of this step – of which Fig. 5990 is a modification – represents the loops sutured to the aponeuroses of the recti muscles (while it does represent the loops leaving the abdominal cavity through the inner aspects of the oblique muscles, which, of course, it must do if it follows the inguinal canal in part of its course). The abdomen is closed in the usual manner.

Comments.—Crossen, in describing this operation performed by the Simpson-Montgomery technic – in which the transit of the large curved needle, attached to the provisional ligature (4 cm. or $1\frac{9}{16}$ inches from the uterine cornua), is in this procedure from within the abdomen outward – states that the needle is carried through the small incision made just beneath the round ligament, at the site of the provisional ligature – thence travels first between the peritoneum and the broad ligament – and then between the peritoneum and the anterior abdominal wall – until it very nearly reaches the outer border of the rectus muscle – where Montgomery, instead of passing back into the peritoneal cavity, as Simpson did, "carried the point of the pedicle needle through the musculo-aponeurotic wall, so that it appeared upon the external surface of the aponeurosis" – presumably the aponeurosis of the rectus muscle – as his illustration corroborates.

In the Mayo technic of this operation the provisional ligature around the round ligaments is conveyed through the abdominal wall by means of special

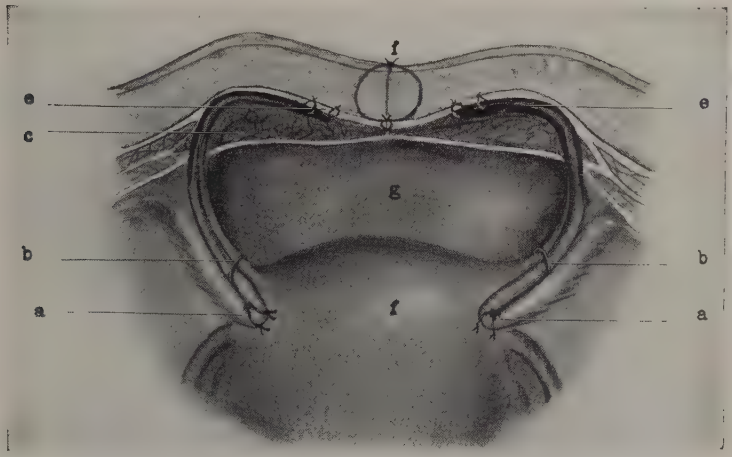


Fig. 5990.—The Same – II; – Sectional view of complete operation: – **a, a,** Suturing of original round ligament loops near cornua of uterus; – **b, b,** opening in broad ligaments along which round ligament loops are drawn; – **c, c,** rectus muscles – to the outer aspect of which lie the oblique abdominal muscles; – **e, e,** anchorages of the round ligament loops to the outer surfaces of the abdominal aponeuroses after the loops have been drawn through the abdominal musculo-aponeurotic wall; – **f,** closure of the median abdominal wound; – **g,** bladder; – **f,** uterus.

forceps carried through the abdominal wall and into the abdominal cavity from the outside – grasping the provisional ligature – or grasping the round ligaments directly through the peritoneal incision over them or just below them (and which are more limited than in the Noble technic) – or grasping the round ligaments through their unincised peritoneal coverings.

The Simpson technic is usually performed through a median abdominal incision – rather than the paramedian, as described in the Noble technic. Sometimes the Pfannenstiel method of approach is employed.

Graves considers the Simpson modification of the Gilliam operation as the best of the various modifications – the only danger, he states, being the possibility that the fundus of the uterus may form adhesions to the anterior abdominal wall, which might cause complications, especially in the event of pregnancy – a possibility, he claims, common to all the types of the Gilliam operations. Graves' technic – especially to avoid these complications – is, in his own words, as follows: – "Through a median incision the round liga-

ment is caught in pressure forceps about 1½ inches from the uterus. A second clamp grasps the parietal peritoneum at the point of the internal ring. The skin is retracted from the wound and the fascia punctured about 1½ inches to the side of the lower angle of the incision. A specially curved clamp is passed through the puncture and obliquely through the rectus muscle, entering the space between the leaves of the broad ligament through the internal ring. It is forced along in the subperitoneal space until it reaches the clamp first placed on the round ligament 1½ inches from the uterus. The curved clamp is forced through the peritoneum and made to grasp the round ligament. It is then drawn out, bringing the loop of round ligament with it through the channel forced by its entrance into the abdominal cavity. The loop of the round ligament is fastened beneath the rent in the fascia by a linen thread, which closes the rent and attaches the ligament at the same time." He stresses the point that the round ligaments must not be taken too close to the uterus – which necessitates the bringing of the uterus so closely against the abdominal wall that direct adhesions are apt to occur – with the possibility of dystocia and intestinal complications.

OPERATION FOR UTERINE RETRODISPLACEMENT, COMPATIBLE WITH PREGNANCY – BY POSTUTERINE ANCHORAGE OF THE ROUND LIGAMENTS IN "SLING" FASHION – BY MEDIAN ABDOMINAL SECTION

BALDY-WEBSTER

Description.—In this procedure the round ligaments are drawn through openings made in the broad ligaments, beneath the utero-ovarian ligaments,

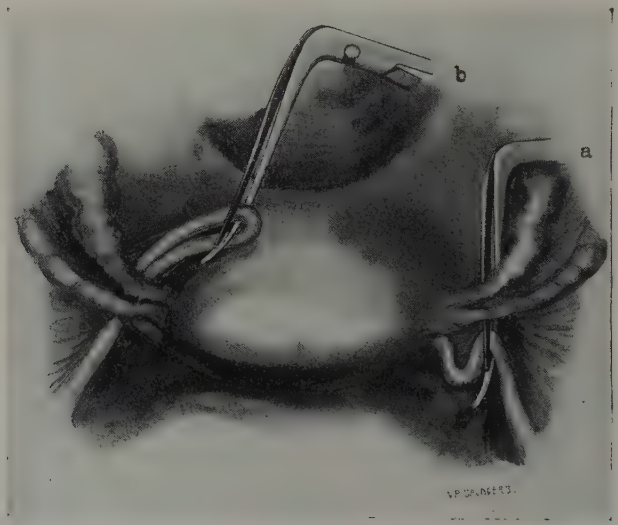


Fig. 5991.—Operation for Uterine Retrodisplacement Compatible with Pregnancy – by Postuterine Anchorage of the Round Ligaments in "Sling" Fashion – by Median Abdominal Section – Baldy-Webster – I; – The broad ligaments have been pierced from behind, just below the utero-ovarian ligament – and the round ligaments are being drawn from the front to the posterior aspect of the uterus, by means, in this case, of Cleveland ligature carriers, a and b.

and are sutured together and to the posterior aspect of the fundus uteri – sling fashion – behind the uterus. In thus shortening the round ligaments the uterus is drawn forward and upward in an artificial hammock, as it were. It is claimed to hold the uterus in more normal position than does any other

operation – and it leaves no bands within the uterine cavity for possible intestinal obstruction – nor openings in the abdominal wall for possible herniæ.

Operation.—The patient is placed in the Trendelenburg position after opening the abdomen. Holding the uterus forward with uterus-grasping forceps, the broad ligament of, first, the right side is punctured with a rather pointed artery clamp, near to the uterus and right under the utero-ovariua ligament – while the utero-ovarian ligament and uterine tube are drawn pnward between thumb and finger – the instrument emerging upon the anterior surface of the broad ligament between the fallopian tube and round ligament. The round ligament is then seized by the instrument at a point about one-third of its length from the uterus (Fig. 5991, **a**), and is drawn backward, through the opening to the posterior aspect of the uterus (v. Fig. 5991, **b**). The round ligament of the left side is then drawn through the left broad ligament in the same manner. Trial is then made, while the round ligaments are held by forceps, to see whether a proper calculation has been made in the particular case – and, if not, more or less of the ligaments must be used –

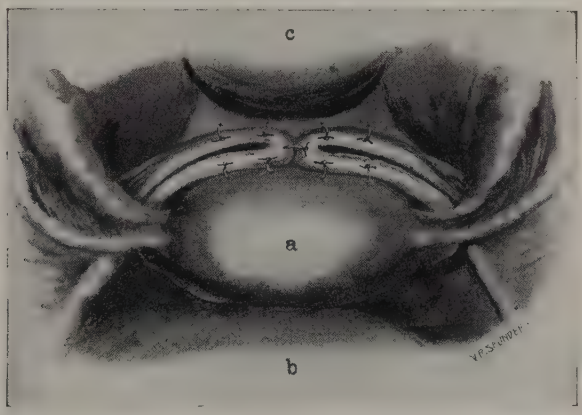


Fig. 5992.—The Same – II; – The round ligament loops have been sutured to each other – and to the posterior surface of the fundus uteri, **a**, beneath the ovaries and tubes; – **c**, rectum; – **b**, bladder.

changing the hold of the forceps to that end – and protruding the uterus forward with the fingers to thoroughly test the matter.

Finally, the two loops of the round ligaments are sutured – first, to each other – and then to the posterior uterine wall. The exact manner of suturing them is open to some variety – just as it is in the Gilliam operation. The usual method of suturing them is seen in Fig. 5992 – though they may be somewhat more spread out than there shown, so as to form a wider "hammock," as it were.

In this, as in all suturings of the round ligaments, only one-half of the thickness of the ligament should be included in any one stitch – so as not to strangulate it.

Comments.—It is important to see that the "sling" is so adjusted to the back of the uterus, before placing the sutures, that its level is exactly right – for it is very evident if the attachment is made too low – and especially if it be too narrow and string-like, it will tend to pull the lower half of the uterus forward – which of necessity will, in turn, topple the upper half of the uterus backward – actually over the band erected for its support – and rather emphasize than improve the backward displacement. Likewise – but less likely,

if the attachment is made too high, and too cord-like, will there be a tendency to anteflex the body of the uterus upon the cervix.

All raw surfaces should be well covered with peritoneum – so as to prevent adhesions.

And any excess of opening after the round ligaments are drawn through should be closed by suture – as a potential opening for a coil of intestine.

Care is to be taken that the round ligaments are not twisted in their transit or in their anchorage.

OPERATION FOR UTERINE RETRODISPLACEMENT, COMPATIBLE WITH PREGNANCY, BY ANTERIOR PLICATION AND ANCHORAGE OF THE ROUND AND BROAD LIGAMENTS – BY MEDIAN ABDOMINAL SECTION

Description.—The round and broad ligaments are brought together from the two sides and sutured to the anterior aspect of the uterus – being so short-

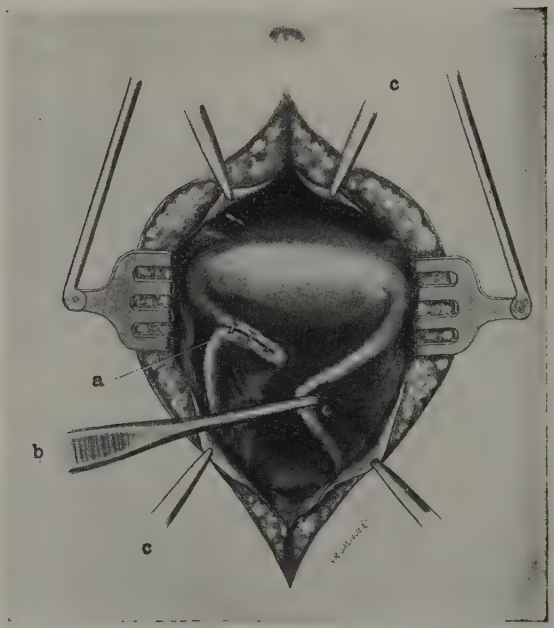


Fig. 5993.—Operation for Uterine Retrodisplacement Compatible with Pregnancy – by Anterior Plication of the Round and Broad Ligaments, and Their Anchorage to the Uterus – by Median Abdominal Section – Menge's Technic – I; – Folding the round ligaments upon themselves – and testing the amount of these, and of the plicated broad ligaments, to be sutured to the anterior surface of the uterus.

ened by the anchorage that they tend to draw the uterus forward. Several varieties of methods (with confusion, as far as the Writer has been able to ascertain, as to priority) are practised in the manner of anchoring the ligaments to the anterior surface of the uterus, dependent largely upon the scarcity or redundancy of ligamentous tissue available.

Operation.—Interrupted chromic catgut sutures are used in the anchorage. Several forms of the application of the round and broad ligaments to the front of the uterus will be described.

In Menge's method of anterior plication and anchorage the amount of material to be dealt with and the effect produced upon the position of the uterus are both tested out in advance – by seizing with forceps the prominent

round ligaments with their downwardly extending broad ligaments, and bringing them in position upon the front of the uterus in the position they will permanently occupy when sutured (Fig. 5993). When the proper calculation is made, a sufficient extent of the round ligaments is sutured together in the

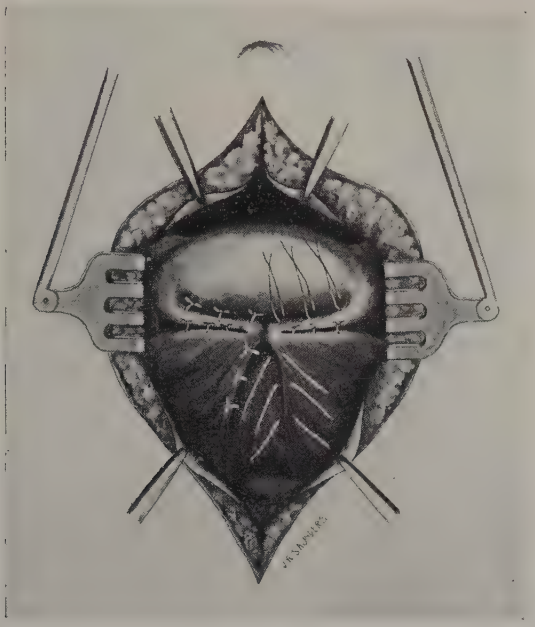


Fig. 5994.—The Same – II; – The plicated round ligaments have been sutured together and to the face of the fundus uteri – and the folded borders of the broad ligaments are being sutured to the body of of the uterus, from the anchored round ligaments, downward.

manner shown in the last illustration, on each side. The doubled together round ligaments are then sutured to the front of the fundus of the uterus in the manner seen in Fig. 5994. When this stage of the operation has been completed, a folded edge of the broad ligament is left upon each side – and

Fig. 5995.—The Same – III; – Showing the features of the completed operation in greater detail.

these two borders of double thickness of broad ligament are, in turn, sutured to the body of the uterus, extending from the level of the round ligament suturing downward on each side of the median line of the posterior surface of the uterus until all of the redundancy is taken up.

Care is taken to obliterate with a suture or two any pockets which may seem likely to be left by the plication and anchorage _ so as to obliterate any recess into which a coil of intestine might get and become strangulated.

The above method of plication and anchorage is shown in somewhat greater detail in Fig. 5995.

Instead of doubling and suturing together any extent of the round ligaments, any excess of length of the round ligaments _ after suturing their

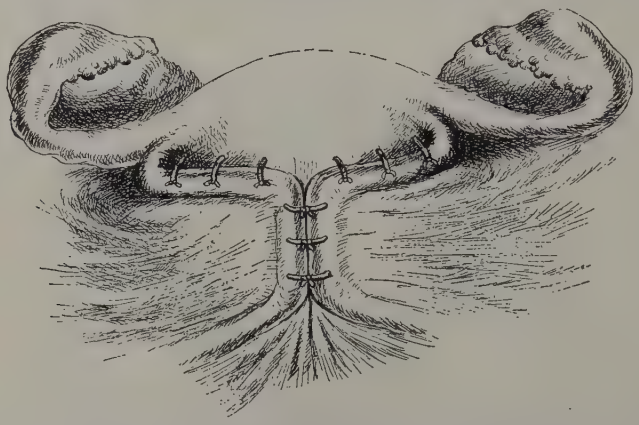


Fig. 5996.—Operation for Uterine Retrodisplacement by Anterior Plication and Anchorage of the Round and Broad Ligaments _ in which the redundancy of round ligaments, drawing the broad ligaments with them, is sutured, first to the fundus uteri, transversely _ and then, to each other, and to the body of the uterus, in a downward direction.

proximal portions mediad _ may be taken up in suturing such excess of extent together in the median line _ in the manner shown in Fig. 5996.

OPERATION FOR UTERINE RETRODISPLACEMENT, COMPATIBLE WITH PREGNANCY, BY POSTERIOR PLICATION AND ANCHORAGE OF THE BROAD LIGAMENTS _ BY MEDIAN ABDOMINAL SECTION

VENABLE

Description.—The principle of the present operation is that folds of the broad ligaments are brought toward the median line, behind the uterus, and sutured along their borders to the posterior surface of the organ _ thus combining an upward and forward lift to the structure. The procedure is especially useful in uterine retrodisplacement in which prolapse is a marked feature.

Operation.—The exposed uterus is lifted forward into the position it is to occupy _ as determined by testing, by bringing the folds together behind the uterus with the two index-fingers, with the amount of vital material available for the technic. While the uterus is held in position by uterus-holding forceps each of the opposite broad ligament folds is brought, in turn, to or as near the posterior median line of the uterus as the redundancy of broad ligament will reach in the individual case _ and sometimes there may be an actual overlapping. The vertical fold of the broad ligament is first anchored with chromic catgut suture at its upper and lower end on each side (Fig. 5997). Other interrupted sutures of the same sort are then applied to each fold between the four primary anchorage stitches _ until the entire length of the broad ligament folds are sutured to the posterior surface of the fundus and body of the uterus.

In carrying the upper anchorage stitches through the broad ligaments the needle carefully transfixes the broad ligament below the ovarian vessels – and the stitches throughout take a good hold upon the uterine wall – the folded border of each broad ligament being steadied by forceps during the placing of the stitches.

The Venable method of placing the initial suture which simultaneously anchors the four corners is needlessly complicated – besides making impossible the correction of any error that may be discovered in the calculation without removing the entire stitch.

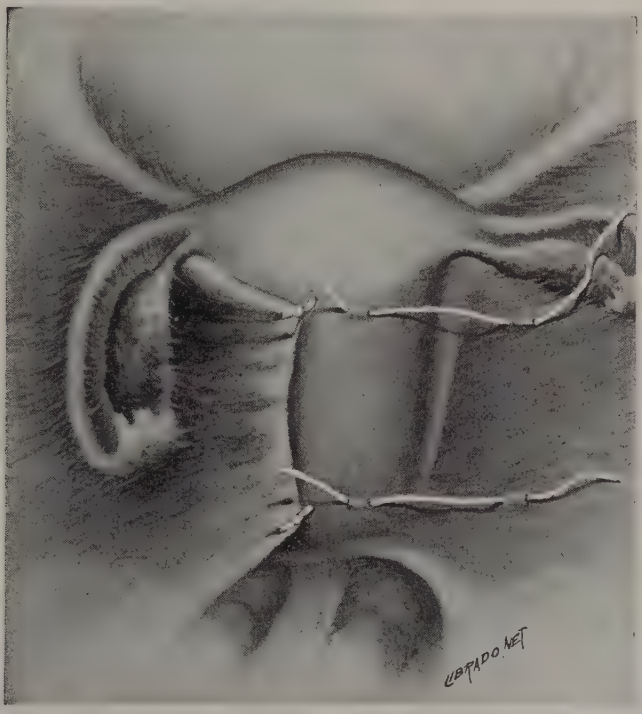


Fig. 5997.—Operation for Uterine Retrodisplacement by Posterior Plication and Anchorage of the Broad Ligaments – by Median Abdominal Section – Venable; – A double fold of broad ligament, brought from each side, is carried and anchored to the posterior aspect of the fundus and body of the uterus by as many sutures as indicated. The right broad ligament is in the act of being anchored to the uterus.

In concluding the operation any pockets which seem at all likely to incarcerate coils of intestine are closed by suturing the serous surfaces together.

OPERATION FOR UTERINE RETRODISPLACEMENT, COMPATIBLE WITH PREGNANCY, BY INTRA-ABDOMINAL SHORTENING OF THE UTERO-SACRAL LIGAMENTS

Description.—The uterosacral ligaments are shortened by being folded upon themselves and sutured – either without exposing them by incision (Noble) – or after exposing them by incision (Bovée). The principle in correcting retrodisplacement, upon which the operation acts, is that by drawing the lower part of the uterus backward, the upper part of the organ is tilted forward. Shortening of the round ligaments is usually simultaneously carried out. The special indication for the procedure is associated retrodis-

placement and prolapse, together with relaxation of the uterosacral ligaments – and particularly if further associated with posterior enterocele (rectocele). The uterosacral ligaments may also be shortened by the vaginal route (v. pp. 410, 411). The operation, all in all, seems far less efficient than several others employed for the same purposes. It may be carried out without or after denuding the ligaments.

Intra-abdominal Shortening of the Undenuded Uterosacral Ligaments – Noble.—The patient is placed in an exaggerated Trendelenburg position, with the parts well exposed, and the uterus held forward by a uterus-holding forceps – which will also bring into relief the uterosacral ligaments. The extent to which the uterosacral ligaments must be shortened will be determined by the special needs of the case and the degree of relaxation of the ligaments. The excess of uterosacral ligament on each side is

Fig. 5998.—Intra-abdominal Shortening of the Unexposed Uterosacral Ligaments – Noble; – A mattress-stitch is seen placed in the fold of the right uterosacral ligament before the pleat is made – which pierces two layers and will throw the pleat ventrad. On the left side two mattress-sutures have been so placed in the left ligament, and tied, penetrating four layers, as to throw the pleat rectad (the direction being immaterial). The opening to the pleated fold is closed by ordinary sutures. (The accompanying shortening of the round ligaments or other technic, if any, is not shown.)

then reefed in by either one or by two mattress-sutures of chromic catgut – dependent upon the amount of shortening sought. The mattress-sutures are placed about 2 cm. ($\frac{3}{4}$ inch) from the uterus (Fig. 5998). When these are tied the ligaments will be correspondingly shortened – the shortening being reinforced, laterally, in proportion as a second or third mattress-stitch is added. The free margins of the sutured redundancy facing the rectum are brought together by two or three sutures to close any potential cavities. The sutures are somewhat differently placed by Noble, who writes: – "A fine silk suture is passed through one uterosacral ligament about 2 cm. (13/16 inch) from the uterus, from within outward. This suture when tied will usually give the necessary amount of shortening of the ligament, but this must be arranged to suit the particular case."

Intra-abdominal Shortening of the Exposed Uterosacral Ligaments – Bovée.—The peritoneum is incised over the uterosacral ligaments – which ear

then exposed by dissection. In the original Bovée technic the ligaments are then folded upon themselves by a long, complex continuous suture of silk or chromic catgut, including the sacral, uterine and apical aspects of the liga-

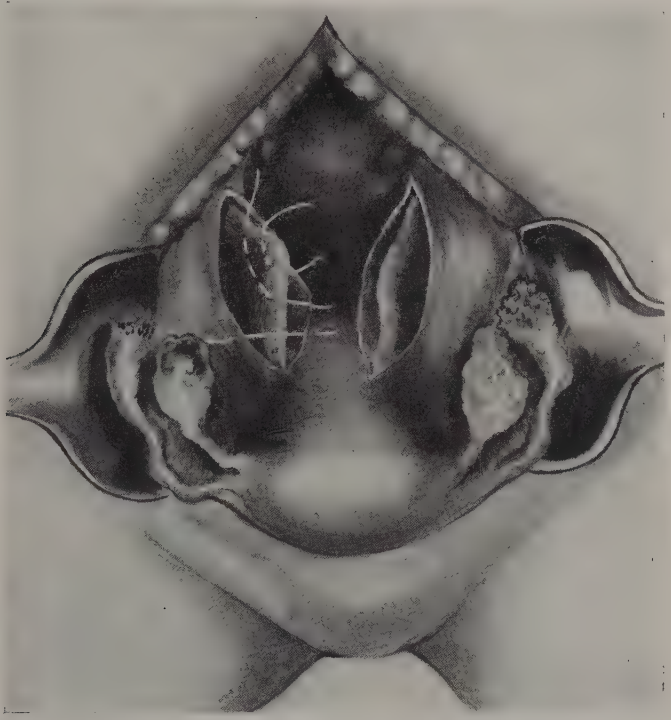


Fig. 5999.—Intra-abdominal Shortening of the Exposed Uterosacral Ligaments – Bovée; – The peritoneum over the left uterosacral ligament has been incised, exposing the ligament. Interrupted sutures (as many as indicated) are placed in the right uterosacral ligament, which, when tied, will correspondingly plicate the ligament upon itself, thereby shortening it to that extent – correspondingly upon both sides. The incised peritoneum will then be closed over the opened beds.

ments, and the cervical tissues – before the stitch is tightened and tied (Fig. 5999). The same practical results may be accomplished by a simpler type of suture. The peritoneum is finally closed over the wounds.

OPERATION FOR UTERINE RETRODISPLACEMENT, INCOMPATIBLE WITH SAFE PREGNANCY – BY ROUND LIGAMENT FIXATION OF THE UTERUS TO THE ABDOMNAL WALL – BY MEDIAN ABDOMINAL SECTION

OLSHAUSEN

Description.—The fundus of the uterus is fixed to the abdominal wall about 5 cm. (2 inches) above the symphysis pubis – by means of two chromic catgut sutures passed through each round ligament, near to the cornua, and then through the abdominal wall or deeply into the abdominal wall. This represents the strongest type of a strictly intra-abdominal fixation of the uterus by the round ligaments. It is sometimes termed a round ligament suspension – but erroneously – if the same features which distinguish uterine fixation from uterine suspension very strictly hold. The majority of Surgeons contend that this and other ventrofixation methods of treating retrodisplacements should not be practised where the patient may be exposed

to pregnancy – while some hold that the Olshausen technic is not incompatible with safe pregnancy.

Operation.—Having opened the abdomen by median section and reconoitered the status of the uterus, the skin and fascia are retracted, lateralward, from the aponeurosis of each rectus muscle, for the extent of about 2.5 cm. (1 inch) on each side of the median section – and at this distance from the margin, a curved needle, carrying No. 2 chromic catgut, is passed through aponeurosis, rectus, and peritoneum – and then from before backward through the center of the round ligament or through its mesoligament at about 1.3

Fig. 6000.—Operation for Uterine Retrodisplacement by Round Ligament Fixation of the Uterus to the Abdominal Wall, or Ventrofixation, by Median Abdominal Section – Olshausen; – The fixation sutures are being carried through the left half of the abdominal wall and round ligament. They have been passed on the right.

cm. ($\frac{1}{2}$ inch) from the cornua of the uterus. A second suture is similarly carried on the same side through the abdominal wall, and then through the center of the round ligament or beneath it from before backward, very near to the uterine horn (Fig. 6000). These two sutures are then clamped and held – while two corresponding sutures are placed on the opposite side – and clamped. The uterus is then lifted, by hand, into the position which it is to occupy – and the sutures are tied, securely but not tightly.

Comments.—The fixation sutures are usually carried through the mesoligament – that is, entirely under the round ligaments rather than through their substance.

The appendix is generally removed as a routine.

Silk is used rather than chromic catgut by some Operators – No. 7, braided.

The fixation sutures are often carried well into the abdominal wall without entirely penetrating even as much of them as indicated above.

Where a single fixation suture is employed on each side (Fig. 6001) it is generally about 1.3 cm. ($\frac{1}{2}$ inch) from the cornu. The sutures should enter the abdominal wall the same distance apart as is the distance between their penetration of the round ligaments – as determined by placing the fundus of the uterus into contact with the abdominal wall. And the distance above the pubis that the fixation is to be made should be decided in the same manner.

When the sutures pass entirely through the abdominal wall they are tied upon the aponeuroses of the recti – but when they pass only deeply into the abdominal wall, they are tied within the abdominal cavity around the round ligaments.

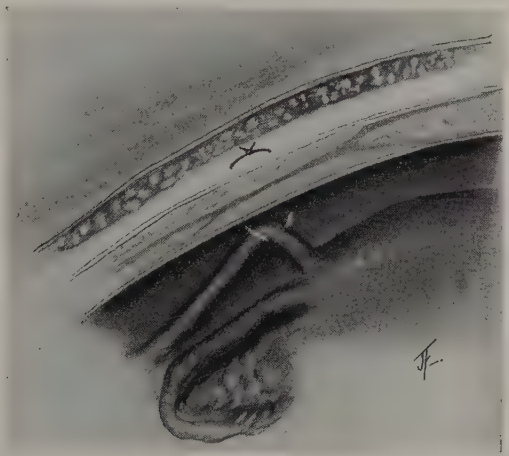


Fig. 6001.—Sectional View of One of the Sutures in the Olshausen Round Ligament Fixation Operation for Uterine Retrodisplacement; – The suture passing through the mesoligament and the main structures of the abdominal wall.

Graves writes: "The success of the operation depends entirely on the tying of the ligatures, the object of which is to create two artificial ligamentous attachments between the abdominal wall and the round ligaments. In order to accomplish it it is necessary to injure mechanically the epithelium of the two contiguous peritoneal surfaces, and this is done by tying the ligature as tightly as possible. Silk is used – because with no other form of ligature can so tight a knot be tied. It is used braided and doubled partly because it will not break in tying the knot, and partly because it will not cut into the tissues when powerful tension is put upon it. It is somewhat undesirable to bury such a large permanent ligature in the abdominal wall, for if there is wound sepsis, it may possibly become infected, and cause a persistent sinus until removed. This does happen once in a while, but the occurrence is so rare that it does not offset the advantages of the ligature. It may be said in passing, that a far more powerful and lasting ligament can be created between the round ligament and the abdominal, than between the uterine and abdominal walls. Fixation of the round ligaments, therefore, is more reliable than fixation of the uterus, both for supporting strength and for the avoidance of immobilizing adhesions."

A disadvantage in the Olshausen operation is that three spaces are left for possible intestinal entanglement – one between the two sites of anchorage and one on each side, between the unnatural site of anchorage of the round ligament of that side and the internal abdominal ring, where it leaves the abdomen on the same side.

Vineberg, for the purpose of strengthening the contact of the fundus with the abdominal wall, and also to obliterate the midspace between the two artificial fixations, has added to the Olshausen technic, as described above, the technic of Leopold – the latter consisting of a simple fixation between the center of the fundus uteri and the median abdominal wall (after, preferably, scarifying the fundus and pushing the peritoneum from the abdominal parietes, as sug-

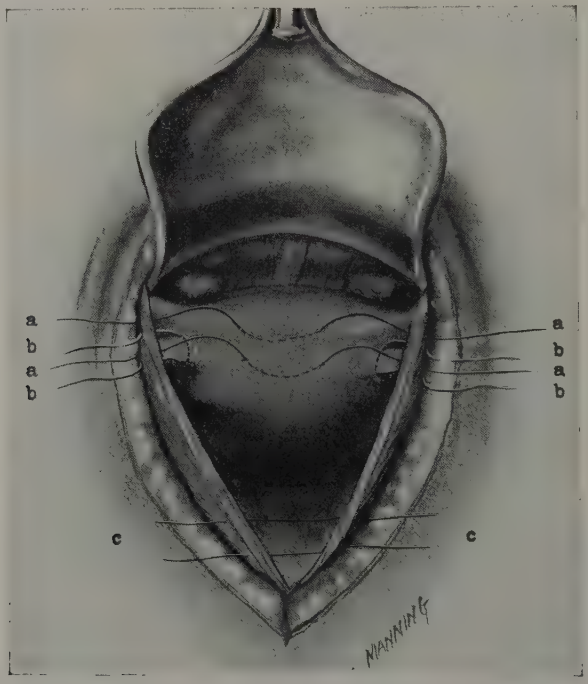


Fig. 6002.—Vineberg's Combined Olshausen's and Leopold's Methods of Round Ligament and Uterine Fixations to the Abdominal Wall for Uterine Retrodisplacement: – b, b, The Olshausen round ligament fixation sutures; – a, a, the Leopold fundus fixation sutures; – c, c, sutures closing the median abdominal wound.

gested by Crossen). The combined Olshausen and Leopold technic, as carried out by Vineberg, is shown in Fig. 6002.

OTHER FORMS OF INTRA-ABDOMINAL OPERATION FOR UTERINE RETRODISPLACEMENT

A considerable number of technical procedures have been evolved for the rectification of uterine retrodisplacement, occurring alone or associated with prolapse of the organ. The most efficient of these have been considered in the preceeding pages. Some additional methods and adjuncts to methods will be here briefly mentioned.

Intra-abdominal Uterine Suspension for Retrodisplacement.—Ventrosuspension consists in the light, loose attachment of the posterior aspect of

the fundus uteri to the peritoneum _ the peritoneum only _ of the anterior abdominal wall by means of two or three sutures (Figs. 6003 and 6004). The operation is undependable _ and is now considered largely historic _ in the

Fig. 6003.—Intra-abdominal Uterine Suspension for Retrodisplacement: _ b, c, d, Sutures passing into the anterior wall of the fundus uteri _ thence through only the peritoneum of the margins of the abdominal wound; _ a, e, such sutures as will unite the margins of the peritoneum from the anterior to the posterior end of the wound.

course of development of other better methods. The operation was supposed not to interfere with pregnancy. It was impossible to know whether the

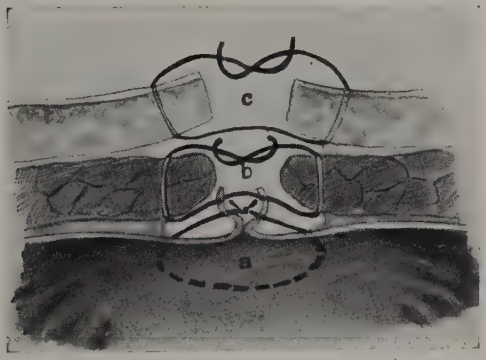


Fig. 6004.—The Same in section: _ a, One of the ventro-suspension sutures; _ b, suture which, instead of being solely of the peritoneal margins, as indicated in the legend of the preceding picture, includes both the peritoneal and muscular margins of the wound; _ c, suture of skin and fascia.

suspending attachments would drag out into useless strings _ or become firm adhesions, endangering the patient in the event of pregnancy. The procedure is certainly inferior to even intra-abdominal uterine fixation to the

anterior abdominal wall, which is itself inferior to many other methods in vogue.

Intra-abdominal Uterine Fixation for Retrodisplacement.—Ventrofixation consists in the firm, direct union between the fundus uteri and the anterior abdominal wall by sutures deeply placed in both uterus and abdominal wall, with or without scarification or denudation of the surfaces in contact (Fig. 6005). The procedure is incompatible with safe pregnancy. The operation is now rarely practised even after the child-bearing period and is distinctly inferior to round ligament fixation of the uterus to the ab-

Fig. 6005.—Intra-abdominal Uterine Fixation for Retrodisplacement. Legueu's Technic: a, a, Loops of chromic catgut carried into the substance of the anterior uterine wall by means of a Reverdin needle and then cut to form two sutures each. Each suture is now threaded through the abdominal wall, also by a Reverdin, and at a distance from the margin corresponding with the entry of the particular suture into the uterine wall; b, b, sutures closing the abdominal wound.

dominal wall (v. p. 609). A number of methods of performing fixation are in vogue.

Subperitoneal Shortening and Anchorage of Round Ligament Loops for Retrodisplacement.—The abdomen is opened in the median line and the uterus is brought forward by hand to test the position the fundus will occupy after reposition. The parietal peritoneum is seized along the line of incision with clamp forceps and limitedly freed from the anterior abdominal wall on each side opposite the uterine cornua. An opening is punctured in each reflected leaf of peritoneum from its fascial toward its free surface through which the puncturing forceps is carried far enough to grasp the round ligaments at approximately 2.5 or 3.7 cm. (1 or $1\frac{1}{2}$ inches) from the cornua of the uterus, according to circumstances by which two opposite

loops of round ligament are drawn through the punctured peritoneum. These loops of round ligament are then anchored between the peritoneum and the

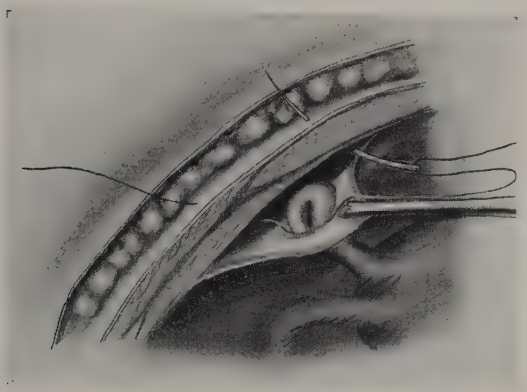


Fig. 6006.—Subperitoneal Shortening and Anchorage of the Round Ligament Loops for Uterine Retrodisplacement; – The parietal peritoneum has been freed from the abdominal wall in the neighborhood of the intended anchorage – and an anchoring suture is seen passing through the aponeuromuscular portion of the abdominal wall and through the loop of the round ligament which has been brought through the punctured parietal peritoneum.

abdominal wall by means of one or more sutures of silk or chromic catgut carried through the abdominal aponeuroses and musculature, and binding

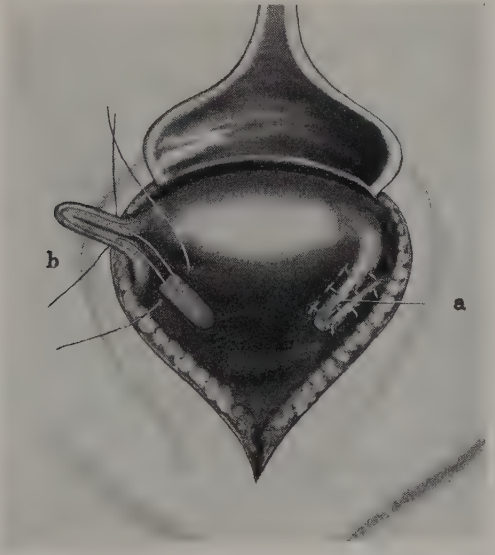


Fig. 6007.—Intraperitoneal Shortening and Anchorage of the Round Ligaments for Uterine Retrodisplacement – Dudley; – The right round ligament has been folded upon itself and sutured together so that it will lie flatwise against the uterus (the sutures showing at a). Its uterine aspect, as well as a corresponding site upon the anterior uterine wall, have been freshened to promote adhesions. The left folded and freshened round ligament, b, will be sutured to a freshened bed upon the front of the uterus.

the loops to the latter (Fig. 6006). The loosened peritoneum is then stitched back to the abdominal wall and the abdomen closed.

Intraperitoneal Shortening and Anchorage of the Round Ligaments for Retrodisplacement _ Dudley.—The round ligaments are folded upon themselves and the two limbs sutured together on each side to the extent considered necessary to produce the desired effect (Fig. 6007, a). Then, at what is found to be the right positions upon the anterior wall of the body of the uterus, two areas are denuded corresponding with the sutured loops of

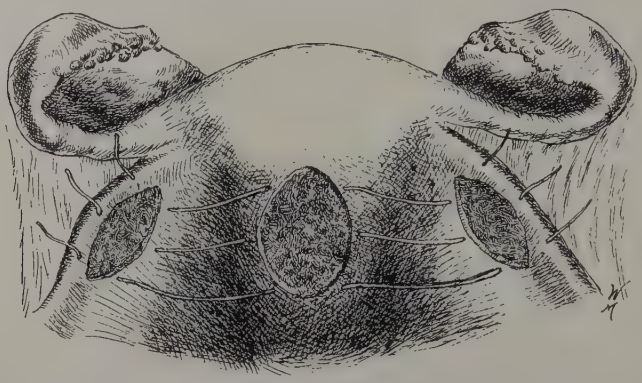


Fig. 6008.—Intra-abdominal Operation for Uterine Retrodisplacement by Anchoring Denuded Surfaces of Round and Broad Ligaments, to a Centrally Denuded Area Upon the Anterior Uterine Wall (Desmopcynosis) _ Dudley; _ The oval areas of denudation are shown with underrunning sutures ready to approximate them.

round ligaments _ the corresponding surfaces of which loops are also denuded. Finally, each sutured loop is additionally sutured to the denuded uterine areas (v. Fig. 6007, b).

Intra-abdominal Operation for Uterine Retrodisplacement by Anchoring Denuded Surfaces of Round and Broad Ligaments to a Centrally Denuded Area Upon the Anterior Uterine Wall _ (Desmopcynosis)

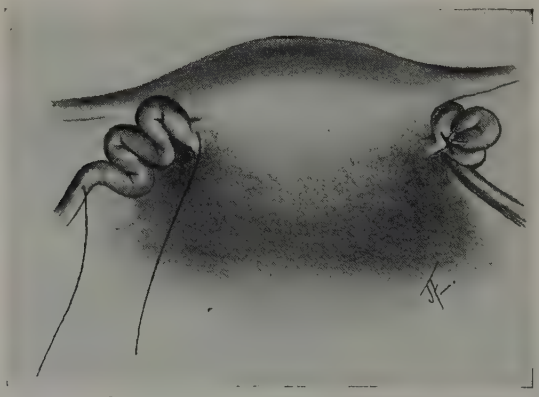


Fig. 6009.—Intra-abdominal Operation for Uterine Retrodisplacement by Round Ligament Folding _ Hartmann's technic.

_ Dudley.—By infolding the two round and broad ligaments together, wing fashion, from each side, calculation is made as to the best sites to make the three areas of oval denudation (Fig. 6008) in order to most advantageously secure results, as to the position into which the structures will be left at the end of the operation. Long lengths of suture are then so placed as to enter

and emerge in near contact with the lateral margins of the areas of denudation – and, beneath them, to pass under their raw beds. When all is ready the wings are folded over the central denudation which is twice the size of the lateral areas – and the sutures tied – thereby drawing the uterus forward to the extent to which the ligaments of the two sides are shortened by the infolding.

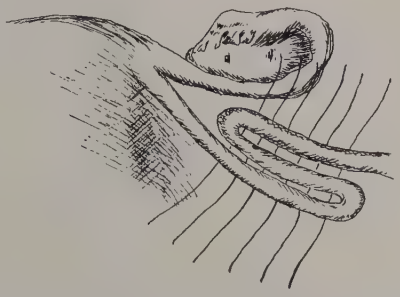


Fig. 6010.—Intra-abdominal Operation for Uterine Retrodisplacement by Round Ligament Folding – Mann's technic.

Intra-abdominal Operation for Uterine Retrodisplacement by Various Types of Round Ligament Foldings and Suturings.—A number of methods of accomplishing the same ends have been devised – but are of secondary usefulness as compared with some of the more substantially effective methods.

In Hartmann's method a suture is run in and out through the substance of the round ligament – which, when drawn upon moderately, assumes the

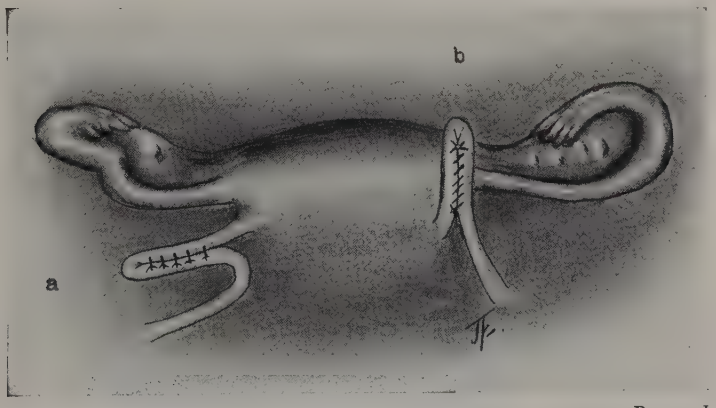


Fig. 6011.—Intra-abdominal Operation for Uterine Retrodisplacement by Round Ligament Folding: – Wylie's technic, a; – Ruggi's technic, b.

shortened form shown in Fig. 6009 on the right side – and, when tightly tied, the still shorter form shown on the left.

In Mann's method of shortening the round ligaments they are doubly folded, so as to present three parallel pieces of ligament at the site – and then sutures are run through these at right angles to their course and tied (Fig. 6010).

In Wylie's method each of the round ligaments is folded and fixed in the transverse direction shown on the right side in Fig. 6011, a.

In Ruggi's method the principle is the same as in Wylie's, but the folding and fixing of the round ligaments on both sides are vertical (v. Fig. 6011, **b,** on the left side).

Fig. 6012.—Operation for Uterine Retrodisplacement by Intra-abdominal Uterovaginal Fixation.

Fig. 6013.—Operation for Uterine Retrodisplacement by Intra-abdominal Uterovesical Fixation.

Operation for Uterine Retrodisplacement by Intra-abdominal Uterovaginal Fixation.—The uterus is brought forward and fastened by sutures

which pass into the anterior wall of the uterus and into the peritoneal aspect of the anterior vaginal wall (Fig. 6012). The operation is contraindicated if pregnancy can occur.

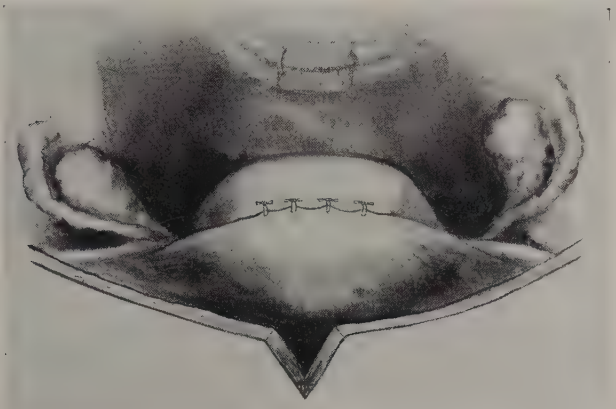


Fig. 6014.—Operation for Uterine Retrodisplacement by Bovee's Method of Uterovesical Fixation – seen from above.

Operation for Uterine Retrodisplacement by Intra-abdominal Uterovesical Fixation.—If the sutures be placed a little higher than described in the preceding operation – that is, between the fundus uteri and the vesical

Fig. 6015.—The Same; – Seen in section.

peritoneum – uterovesical fixation is said to be accomplished. This procedure is also contraindicated if pregnancy be possible.

Another view of the operation – which is sometimes indifferently termed uterosuspension or uterofixation (though literally a fixation) – is seen in Fig. 6013.

Another form of uterovesical fixation is Bovée's technic _ in which the retroverted uterus is brought forward and anchored partially beneath a peritoneal pouch dissected from the bladder (Figs. 6014 and 6015).

Intra-abdominal Operation for Marked Uterine Retrodisplacement and Prolapse by Extraperitoneal Anchorage of the Fundus Uteri _ Exohysteropexy _ Kocher.—The abdomen is opened in the median line and the patient placed in Trendelenburg's position. An examination of the pelvic cavity is made _ and the uterus is delivered into the abdominal opening _ and

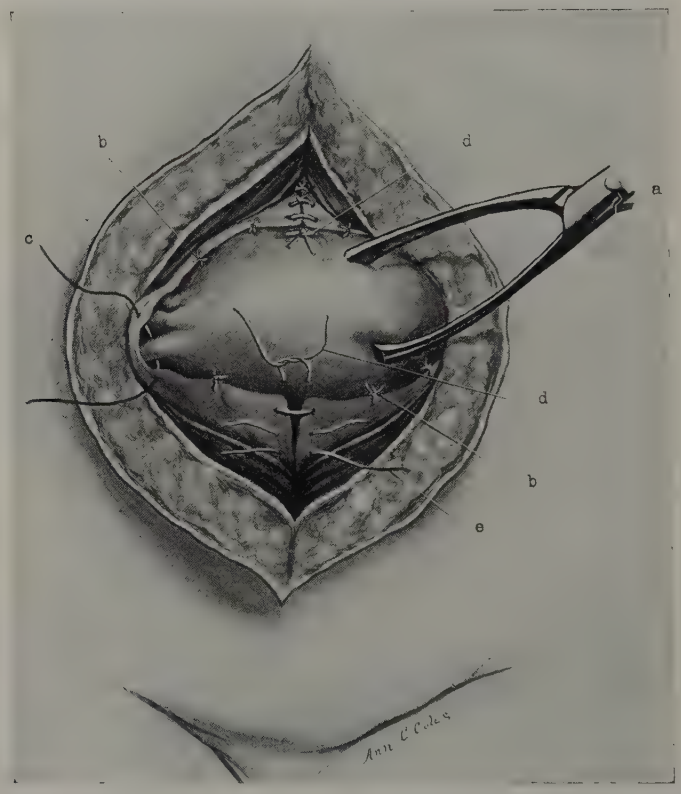


Fig. 6016.—Intra-abdominal Operation for Marked Uterine Retrodisplacement and Prolapse by Extraperitoneal Anchorage of the Fundus Uteri _ Exohysteropexy _ Kocher _ I; _ Anchorage of the uterus in the abdominal wound: _ a, Vulsellum holding the fundus forward; _ b, b, sutures uniting the parietal peritoneum to the uterine peritoneum; _ c, suture uniting the round ligaments to the abdominal peritoneum; _ d, d, sutures closing the margins of the peritoneum at the upper and lower ends of the wound, including the serosa of the uterus; _ e, suture of peritoneal margins. (Figs. 6016 and 6117 modified from Döderlein.)

held protruding into the wound by means of vulsellum forceps (Fig. 6016). The parietal peritoneum is then drawn from all directions around the base of the presenting fundus uteri _ and is everywhere sutured by interrupted chromic catgut stitches around the base of the fundus _ so that the upper aspect of the fundus is held projecting into the abdominal wound. The uterine appendages all remain within the cavity _ but the round ligaments, near the uterine cornua are transfixed by sutures which at the same time pass through the overlying peritoneum and bind them together Sufficient room for the distensible bladder is carefully provided for in making the calculations _ that is,

the fundus is not anchored too close to the symphysis. When the parietal peritoneum has been sutured entirely around the portion of the uterus which is thus made to present through the circular opening in the peritoneum thus formed, the overlying abdominal wall structures are brought together by suture directly over the fundus, projecting prominently into the wound. These structures _ minus the parietal peritoneum _ are sutured together exactly as they are in a median abdominal section (Fig. 6017, **e**), except that the fundus of the uterus will come directly into the raw bed of the wound without any

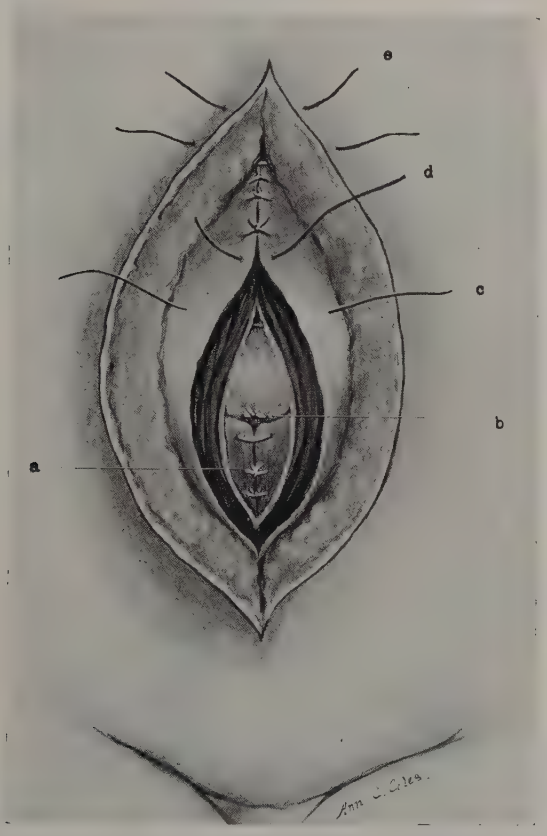


Fig. 6017.—The Same _ II; _ Closing the abdominal wound: _ **a,** Suture uniting peritoneum; _ **b,** suture uniting peritoneum to itself and to uterus; _ **c,** deep sutures uniting full thickness of abdominal aponeuromuscular wall; _ **d,** superficial muscle sutures; _ **e,** skin-closing sutures. A temporary drain will be passed through the lower end of the wound.

intervening parietal peritoneum to come into contact with its own visceral peritoneum. And to make the union between the raw and uterine surfaces even denser and stronger the presenting peritoneal surface of the uterus may be frictioned with gauze, or a nail-brush, or gently scraped by instrument. The object is to form an unusually firm, unyielding, sustaining, and unstretchable union between the fundus uteri and the anterior abdominal wall. The technic is practically a submuscular fixation of the uterus to the abdominal wall. The procedure is, of course, not to be contemplated if pregnancy be possible _ and its most pronounced indication is when marked prolapse accom-

panies retroversion. In closing the wound a glass drain is temporarily inserted into the pelvis at the lower part of the wound in front of the uterus.

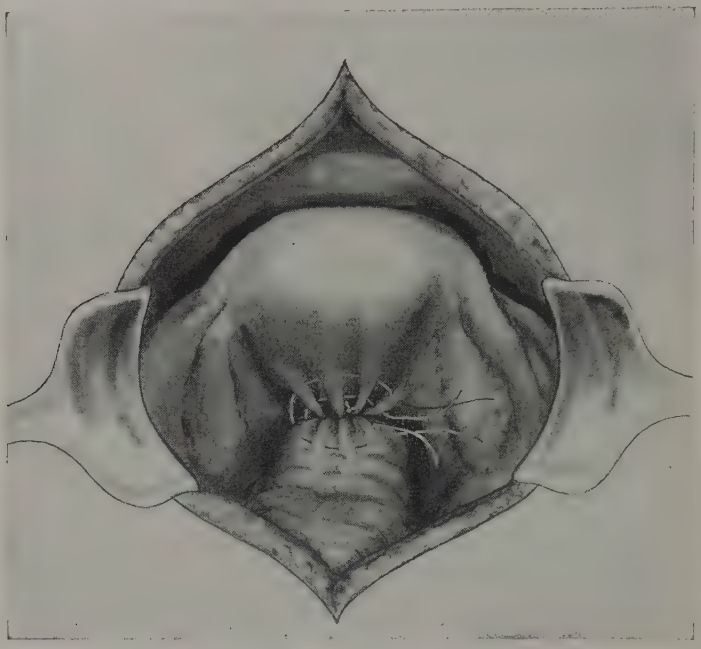


Fig. 6018.—Obliteration of Douglas' Culdesac by Tiers of Circular Suturing – seen from within the pelvis.

Fig. 6019.—The Same; – Seen in section.

Operative measures accessorily helpful in intra-abdominal procedures for the correction of uterine retrodisplacement and prolapse may also contribute

their share in the final accomplishment of results. Such an illustration is seen in the

Operative Obliteration of Douglas' Culdesac as a Contributing Aid to the Operations for the Correction of Some Cases of Uterine Retrodisplacement and Prolapse.—The obliteration of the recto-uterine peritoneal pouch with the aid that this accomplishes, especially in prolapse, has been secured by a few successive tiers of circular suturing _ each succeeding tier burying in the preceding tier _ as seen from within the pelvis in Fig. 6018 _ and in sectional view in Fig. 6019.

POSTERIOR CUNEOHYSTERECTOMY FOR UTERINE ANTEFLEXION _ BY THE ABDOMINAL ROUTE

THIRIAR

This procedure is identical in technical detail with Jonnesco's intra-abdominal operation for retroflexion of the uterus which is described and illustrated on p. 624, except that the technic is applied to the posterior wall of the uterus _ and will not be separately described here.

ABDOMINAL OPERATIONS FOR RETROFLEXION OF THE UTERUS

General.—Special intra-abdominal operations upon the retroflexed uterus are unusual. And those performed by the vaginal route (already described, pp. 405–413) are infrequent. The procedures, when carried out, are generally for the purpose of straightening the bend in the uterocervical canal for the relief of dysmenorrheal symptoms.

Operations for retroversion _ given on pp. 587–623 under the general heading of Retrodisplacements _ usually correct retroflexion when in ordinary degree _ as well as retroversion.

One or more operations will be mentioned here:

Anterior Cuneohysterectomy for Uterine Retroflexion _ Jonnesco.—The principle of this procedure is to lessen the anterior wall of the uterus by the excision of a wedge-shaped piece, extending transversely, followed by the suturing of the walls of the wound.

After opening the abdomen the patient is put into the Trendelenburg position _ the uterus displaced backward and the bladder drawn well forward, so as to open up the vesico-uterine pouch as fully as possible. A transverse incision is made through the uterine serosa, immediately over the maximum of convexity of the forward bulge caused by the backward bending of the body of the uterus at its junction with the cervix. These flaps of peritoneum are retracted upward and downward _ after which a cuneiform portion of the anterior uterine wall is excised _ usually from 1.5 to 2 cm. (9/16–13/16 inch) in vertical depth _ but not extending, transversely, entirely to the lateral borders of the uterus, thereby avoiding the important vessels which would give troublesome hemorrhage. A wedge-shaped piece within these dimensions is then excised, but not extending into the mucosa (Fig. 6020). The body of the uterus is then drawn into straight line with the cervix _ and the upper and lower aspects of the wedge are brought into contact by both a deeper and more superficial tier of buried chromic catgut sutures (Fig. 6021), after which the margins of peritoneum (the uterine serosa) are brought together by suture.

If an elliptic piece of serosa be first excised or be included in the act of excising the wedge, there is less redundancy of uterine peritoneal covering to be dealt with in suturing these margins.

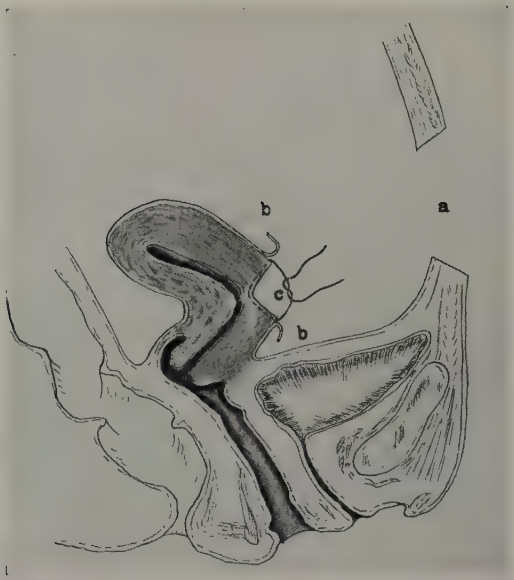


Fig. 6020.—Anterior Cuneohysterectomy for Uterine Retroflexion – Jonnesco – I; – Lateral view of the wedge-shaped excision from the anterior uterine wall; – c, site of excision; – b, b, serosal flaps turned back (these are absent when the area of excision is made more elliptic); – a, abdominal opening through which the field of operation is exposed.

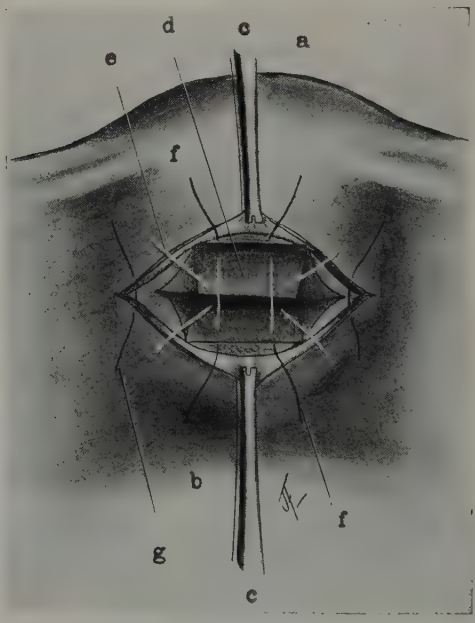


Fig. 6021.—The Same – II; – Suturing the uterine wound: – a, Fundus uteri; – c, c, tractors of the separated uterine serosal flaps; – d, depth of wedge-shaped uterine wound; – e, deeper buried sutures; – f, more superficial buried sutures; – g, sutures of the serosal margins.

This technic may be practised through the vagina after incising the anterior vesico-uterine pouch through the anterior vaginal fornix.

Pestalozza's Intra-abdominal Operation for Retroflexion of the Uterus.—This procedure is briefly described by Hartmann in the following wording (which, however, does not make the technic perfectly plain): – "At the upper limit of the inferior segment of the uterus Pestalozza incises on the anterior surface the serous membrane and the subjacent muscular layer. He separates the flap with his finger as far as the level of the vesical dome, and then passing a suture through the anterior surface of the anteflexed uterus, he traverses the middle of the flap. A series of secondary sutures are inserted laterally as far as the broad ligaments, so as to completely close up the denuded surface. By passing the sutures more or less high up on the anterior surface of the uterus we obtain a more or less extensive area with the flap, and we can thus determine the degree of anteflexion accordingly."

OPERATION FOR UTERINE INVERSION BY MEDIAN HYSTEROTOMY THROUGH MEDIAN ABDOMINAL SECTION

DOBBIN

The abdomen is opened by median section – and the patient placed in the Trendelenburg position. The anterior wall of the uterus is then carefully incised in the median line – calculating that the incision will divide the most constricting portion of the uterus. The section is made, practically, just as

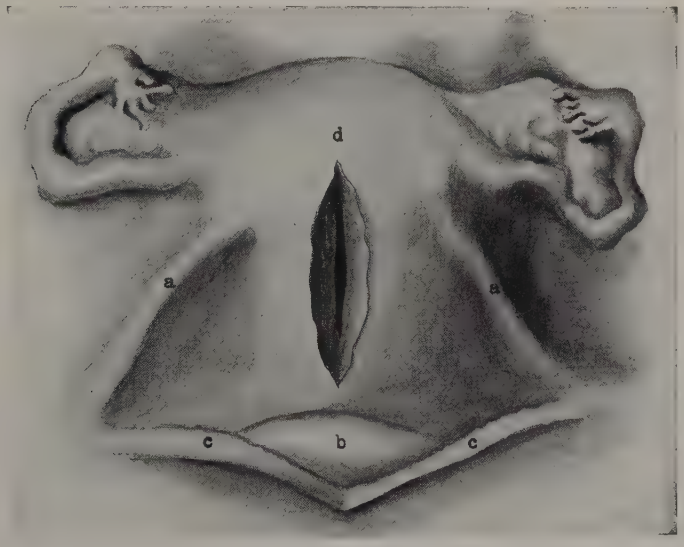


Fig. 6022.—Operation for Uterine Inversion by Median Hysterotomy Through Median Abdominal Section – Dobbin. (Redrawn from Kelly.)

for median cesarean section – though possibly lower – and may be from 5 to 10 cm. (2–4 inches) in length (Fig. 6022). Following section the inversion is usually readily reduced by manipulation.

The uterine incision is closed by buried, non-penetrating – and surface sutures of chromic catgut – and the abdominal wound, in the usual manner.

ABDOMINAL EXCISION OF UTERINE MYOMATA

General.—Uterine myomata may be single or multiple – pedunculated or sessile – and the sessile may be subserous, intramural, or submucous.

The routes by which these tumors may be removed are vaginal (considered on pp. 441–446) and abdominal. The latter is the usual route chosen – except for pedunculated tumors presenting within the uterus

The methods of removing uterine myomata through the abdomen are the following: – myomectomy by elliptic excision – myomectomy by enucleation – cuneiform partial hysteromyomectomy (in which part of the full thickness of the uterine wall is removed without penetrating the cavity) – supravaginal partial hysteromyomectomy (in which the body of the uterus is removed along with the tumor or tumors) – and total hysteromyomectomy. The first three of these will be considered in order. The last two will be found among the total excisions of the uterus.

In operating on all uterine myomata by the abdominal route the uterine cavity and vagina should be swabbed out with the tincture of iodin in advance – in the event that the uterine cavity should be unexpectedly entered in the course of the intra-abdominal operation.

Uterine Myomectomy of Pedunculated Tumors by Elliptic Excision.—This type of operation is especially applicable to small or medium tumors with pedunculated attachment to the wall of the uterus. The base of the pedicle of the tumor is surrounded by an elliptic incision – so planned that, while broad enough at its maximum width to embrace the pedicle, it still makes provision for the coming together of the walls of the wound bed. The general

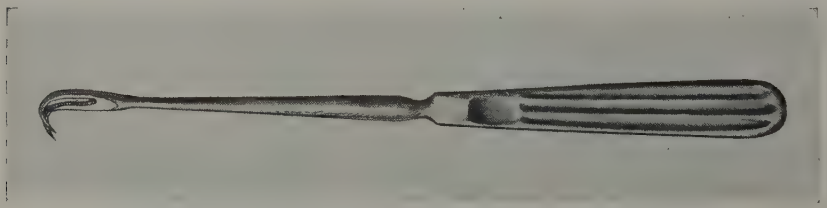


Fig. 6023.—Fritsch's Double-hook Uterine Tenaculum Retractor.

plan of the section is wedge shaped – and it is not carried, in depth, into the uterine mucosa. In the making of the circumscribing incision the tumor is held either by the fingers or by some form of grasping instrument of the vulsellum type or by tenaculum forceps or double tenaculum (Fig. 6023). When the sides of the cuneiform incision are deepened until they meet beneath the pedicle of the tumor the entire mass is readily removed (Fig. 6024). In closing the wound bed of a comparatively small tumor thus made, usually a single layer of chromic catgut sutures suffices – while in the bed from which a larger tumor has been removed a double layer may be required.

Sometimes the conformation of the pedicle of these tumors is such the technic above described will not make provision for the ready closing of the wound. This is particularly apt to be the case with pedicles of some size – and in such cases one may circumvent the difficulty by planning two partial flaps by allowing the sides of the elliptic incisions to extend upon the pedicle rather than be placed entirely upon the surface of the uterus. Then, when the tumor is removed, the wound may be completely covered by both buried suturing and superficial suturing of the small flaps.

Uterine Myomectomy of Sessile Tumors by Enucleation.—The general method of procedure in removing this type of myoma is that of making a single straight overlying incision corresponding with its greatest measurement, and of then enucleating the tumor from its bed without anywhere invading the uterine tissue except in making the incision through that portion

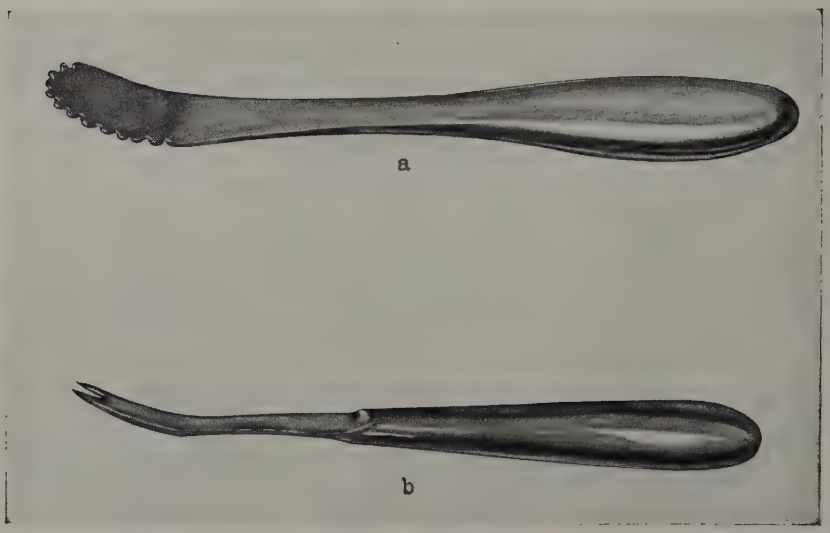
of the uterine wall which intervenes between the surface of the organ and the more external wall of the tumor. These tumors are often of considerable size _ and are sometimes awkwardly placed and may present considerable difficulty

Fig. 6024.—Abdominal Excision of a Pedunculated Uterine Fibromyoma; _ The bed of the tumor is shown, out of which, in wedge-shaped manner, the pedicle of the tumor has been cut _ not penetrating the uterine cavity. Buried and marginal sutures will close this bed and bring the gaping walls together. The excised tumor and its pedicle are seen above.

of access _ as well as difficulty of enucleation. Nothing can be simpler than the enucleation of a small, prominent uterine myoma _ whereas large ones, situated low down, and especially if complicated by the presence of adhesions, may present very serious obstacles to the Surgeon's efforts. Various special

Fig. 6025.—Segond's Myoma-knife.

forms of instruments have been devised for accomplishing enucleation of these tumors both by the abdominal and by the vaginal routes _ such as are shown in Figs. 6025–6030. And a good form of grasping forceps in dealing with



Figs. 6026 and 6027.—a, Kelly's Crenated Myoma-enucleator; b, Kelly's Myoma-pick. (Redrawn from Kelly.)

Fig. 6028.—Sims' Myoma-screw.

the larger tumors is seen in Fig. 6031. Aid may often be secured by steadying the uterus, additionally, by tractor or special grasping forceps.

Naturally, the subserous type of tumor is usually, other features being equal, the easiest type to deal with – the intramural next – and the submucous the least.

The overlying incision is deepened, through whatever uterine tissues intervene, down to the wall of the tumor. The margins of the wound are then

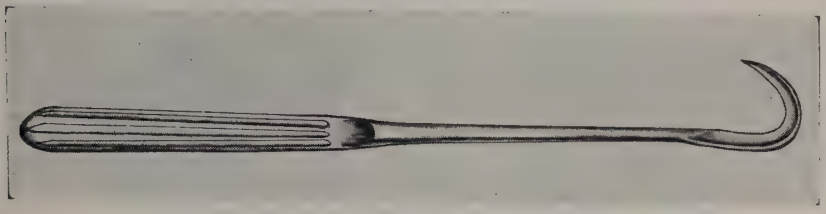


Fig. 6029.—Sickle-shaped Myoma-knife.

either retracted by special bilateral tractors or are automatically retracted by the instrument with which the enucleation is being performed. The general method of manipulating the various enucleating instruments here shown is seen in Fig. 6032.

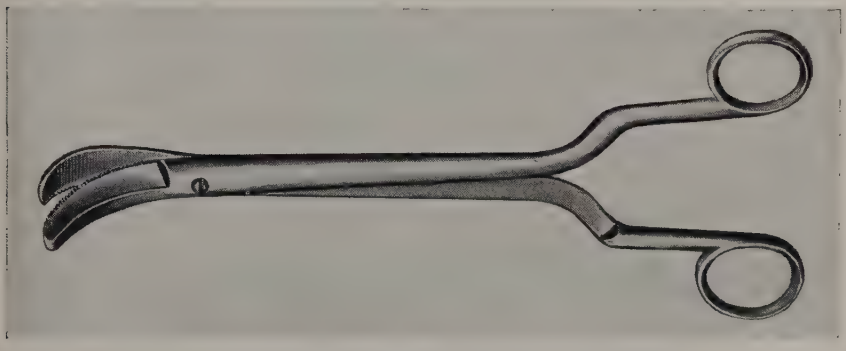


Fig. 6030.—Doyen's Serrated Uterine Scissors.

These tumors usually leave a smooth bed following disencapsulation – but sometimes the enucleation is accomplished after more or less ragging-up of the tumor bed. As soon as the tumor comes away its bed is examined and all bleeding vessels are ligated with chromic catgut. Any marked roughness or tagging of the bed should be trimmed away.

Fig. 6031.—Morcellation Forceps.

Avoidance of opening the uterine cavity is most desirable – its entry being sometimes the inadvertent result of using the curved scissors or other instrument behind the tumor in attempting to free that aspect of it from its bed.

Such opening, thus made, should be repaired by chromic catgut suture as soon as the tumor has been removed – to shut off infection from that source.

Sometimes the wall of the tumor is only to be recognized from the uterine tissue by a difference in the direction of the constituent fibers of each.

In proportion as the tumor may partake of the non-enucleable type – such as adenomyomata – will it have to be dissected, rather than enucleated, from its bed – constituting more of a surgical procedure and, usually, with more bleeding.

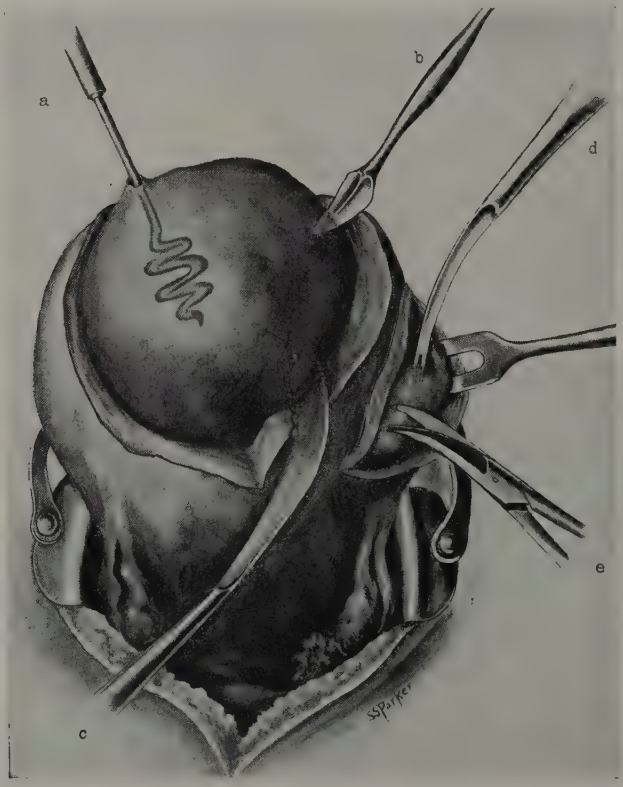


Fig. 6032.—Abdominal Myoma Enucleation of an Intramural Uterine Tumor – I; – A liberal incision has been made over a large intramural myoma of the body of the uterus. The myoma is being delivered by blunt dissection, by the combined means of Syms' myoma-screw, **a**, Segmond's myoma-knife, **b**, and Kelly's crenated enucleator, **c**. The smaller myoma is seized by Kelly's myoma-pick, **d**, and is being dissected from its bed by half-blunt curved scissors, **e**.

Fatalities have occurred from overlooked sources of bleeding – the untied vessels subsequently becoming active bleeders. Many of these tumors are well nourished with vessels. If the sessile tumor be large, considerable hemorrhage may occur from its bed – and the uterus itself may be considerably damaged in its removal.

When hemostasis has been made absolutely satisfactory the bed of the tumor is closed by buried chromic catgut sutures. In the beds of small tumors a single layer may suffice, and, indeed, in some cases the sutures may not even have to be buried, but may be brought out through the margins of the wound – being so placed in the center of the tumor, however, as to approximate its deeper portions (Fig. 6033) – the smaller tumor bed. In the beds of

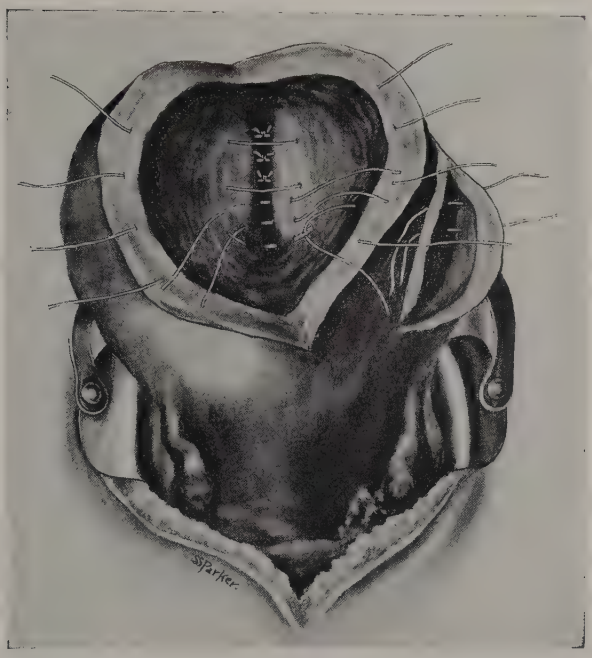


Fig. 6033.—The Same _ II; _ Closing the beds of the enucleated tumors; _ The depths of the beds of the enucleated tumors are being closed by a single or double tier of buried chromic catgut sutures, according to their size and depth. One or two marginal sutures are shown. Smaller beds may often be closed by a single tier of sutures.

Fig. 6034.—The Same _ III; _ The finally sutured margins of the tumor beds

larger tumors several tiers of buried sutures may have to be placed _ usually at least two (v. Fig. 6033, the larger tumor bed). In this suturing, needles of the Hagedorn type should not be used _ nor even are surgical needles entirely safe _ the round-pointed needles being much less apt to cut the vessels beneath the bed of the tumor. The appearance of the finally sutured wound is as shown in Fig. 6034.

A uterus whose surface presents many sutured incisions _ or even a single one _ and whose walls may be rendered lax by the removal of much of their source of stiffness, is inclined to drop backward and to form adhesions. It is, therefore, usually wise, at the end of the tumor operation, to fix the uterus in some forward position, preferably by one of the types of operation which does not interfere with the functions of the organ.

Uterine Myomectomy by Cuneiform Partial Hysteromyomectomy.— In this type of operation the entire thickness of that aspect of the uterine wall

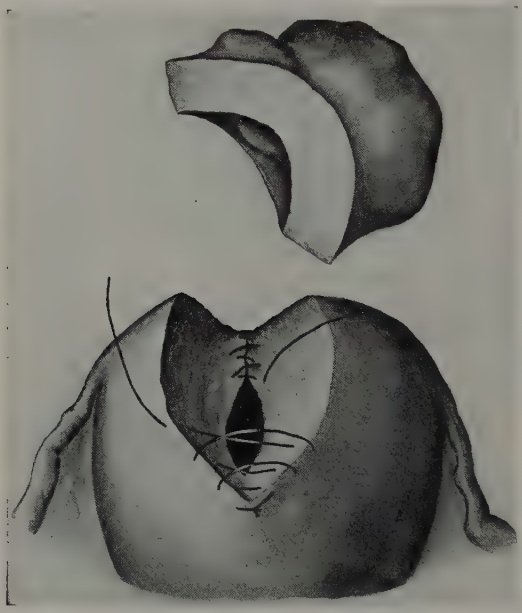


Fig. 6035.—Uterine Myomectomy by Cuneiform Partial Hysteromyomectomy; _ The wedge-shaped portion of entire thickness of uterine wall, including the tumor or tumors, has been excised, opening the uterine cavity. The bed of the tumor is being closed by two tiers of buried sutures.

which bears the tumor is cut through _ by an elliptic form of incision, circumventing the base of the tumor and meeting in front of and behind it _ and passing into the uterine cavity. It is well to make provision for the control of hemorrhage before making the section _ preferably by temporarily applied rubber-covered clamps to the broad ligaments. It will usually be possible to control at least the circulation of the ovarian vessels in this way, and this technic is generally only applicable to that portion of the uterus which receives a large part of its blood from those vessels. The tumor or tumors and wedge-shaped portion of the uterine wall are thus removed *en masse* (Fig. 6035). Careful search is then made for all isolatable vessels in the divided walls _ which are clamped and tied _ and afterward tested by releasing whatever form of vessel control may have been used, if any.

The suturing of the parts is next in order _ and this is done, usually, by

two layers of chromic catgut suturing – none of which enter the uterine cavity. The first layer is applied as shown in Fig. 6035. The second tier is introduced so as to bring together the rest of the thickness of the uterine wall, including the margins of the serosal surface of the uterus.

ABDOMINAL HYSTERECTOMY, IN GENERAL

The uterus may be removed either by the vaginal route (considered on pp. 459–507) or by the abdominal route – the latter method being preferable in the majority of instances. The basis of this preference rests upon the following: – the ability afforded to investigate and know the status of the entire pelvic pathology – the opportunity to correct all of these conditions or as much as may be correctible – the ability to do much better technical work through the opened abdomen – the far less likelihood of adding surgical damage to already existing pathologic conditions – and, frequently, the ability to remove many uteri by this route which are entirely unremovable

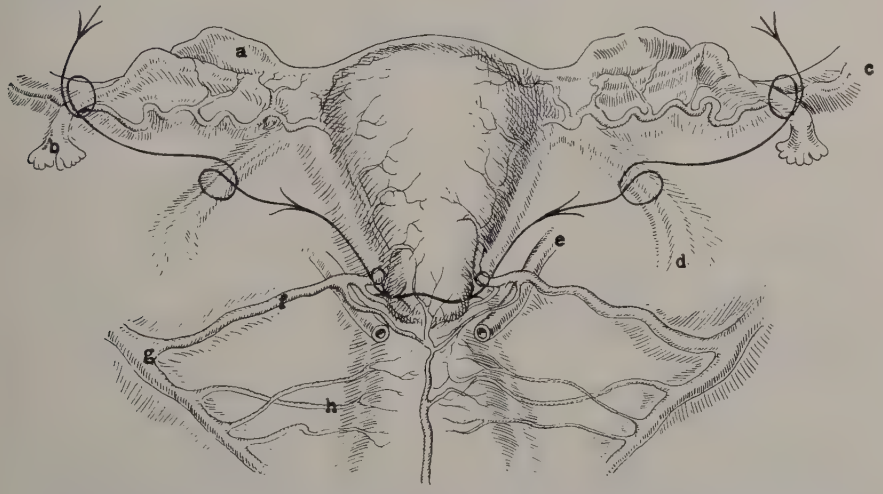


Fig. 6086.—Scheme of Ligations and Direction of Incisions in Supravaginal or Total Abdominal Hysterectomy – by Bilateral Broad Ligament Incisions from Fundus to Cervix or Vagina, Connected by Transverse Cervical Incision from Left to Right: – a, Ovary; – b, tube; – c, ovarian artery; – d, round ligament; – e, ureter; – f, uterine artery; – g, iliac artery.

by any other. (The Author recalls a prominent incident in the earlier history of vaginal hysterectomy, when one of the most important special hospitals of this country was thrown open – and the Profession was invited in celebration – to witness, among other incidents, the removal of a uterus by the vagina. In the amphitheater, before a large gathering, the Surgeon undertook a vaginal hysterectomy – worked laboriously – perspired profusely – possibly damaged the woman considerably – and apologized amply to his confrères for his failure to dislodge the uterus, as the patient was removed.

Chief Indications for Abdominal Hysterectomy.—Cancer – myofibromata – marked infection or disease of the uterus with or without involvement of the appendages – extensive involvements of the uterus, appendages, and adjacent viscera in adhesions – uncontrollable uterine hemorrhage – marked uterine deformity – marked uterine displacement, especially in prolapse – marked and uncontrollable dysmenorrhea.

The ovaries should be invariably preserved if it be at all possible to do so – or at least one – or part of one ovary.

Baldy writes: "Except in the presence of malignant or tubercular disease the womb should never be disturbed if even a portion of one ovary and a fallopian tube can with safety be preserved."

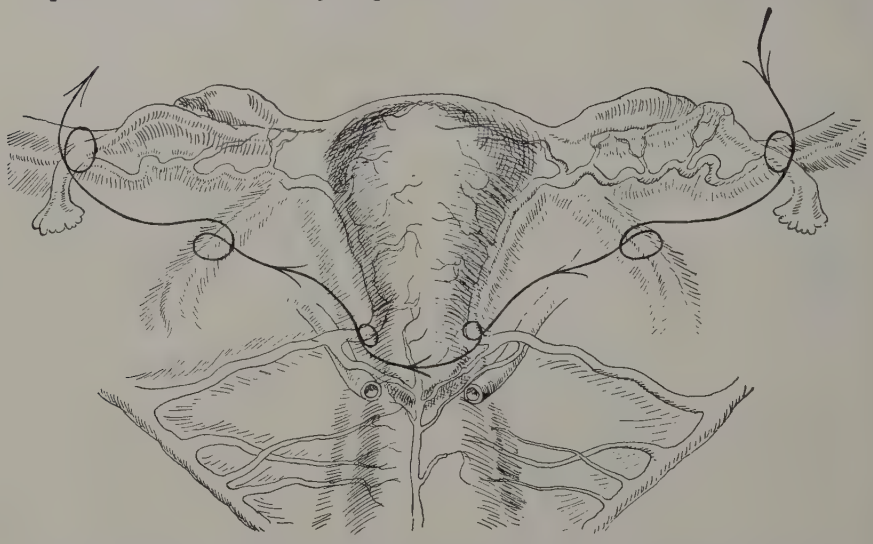


Fig. 6037.—Scheme of Ligations and Direction of Incisions in Supravaginal or Total Abdominal Hysterectomy – by Continuous Descending, Transverse, and Ascending "Left to Right" Incision.

Some Surgeons advise hysterectomy, *ipso facto*, whenever double ovariectomy or double oöphorosalpingectomy must be performed – but this course is condemned by the majority of Surgeons.

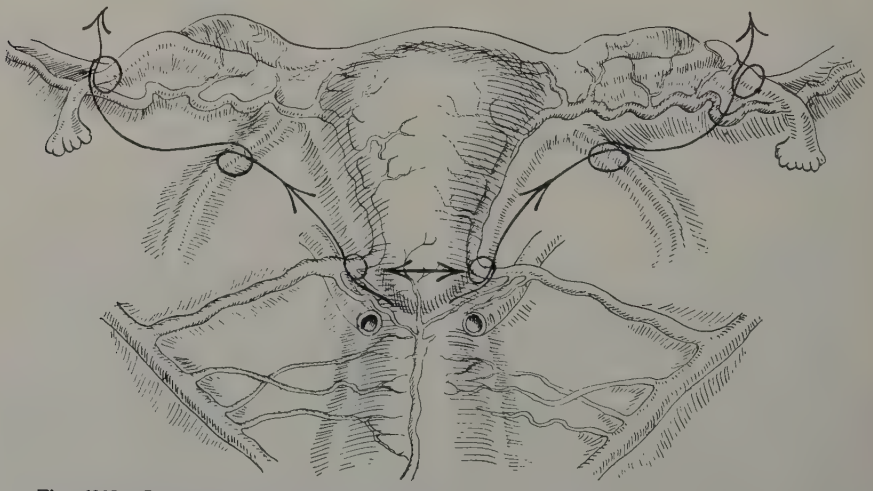


Fig. 6038.—Scheme of Ligations and Direction of Incisions in Supravaginal or Total Abdominal Hysterectomy – by Transverse Division of the Cervix or Vagina, Followed by Division of the Broad Ligaments from Below Upward.

Methods of Abdominal Hysterectomy:
(Methods of vaginal hysterectomy are described on pp. 459–507.)

(*a*) Abdominal Cuneiform Hysterectomy _ the removal of a wedge-shaped portion of the body of the uterus _ described and pictured under Cuneiform Partial Hysteromyomectomy (v. p. 632).

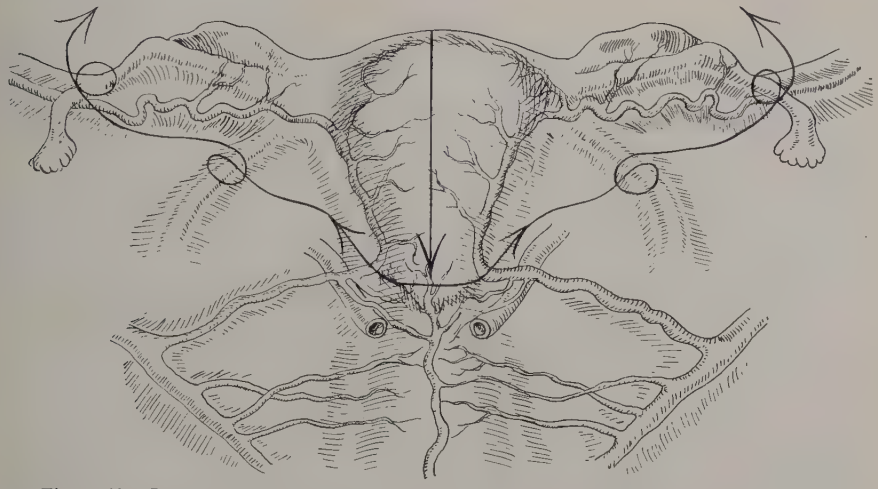


Fig. 6039.—Scheme of Ligations and Direction of Incisions in Supravaginal or Total Abdominal Hysterectomy _ by Vertical Median Bisection of the Uterus from Fundus to Cervix, Followed by Transverse Division of the Cervices of the Split Halves, or of the Vagina, and Division of the Broad Ligaments from Below Upward.

(*b*) Abdominal Supravaginal Hysterectomy _ the excision of the uterus at the level of the internal os. Sometimes called subtotal hysterectomy.

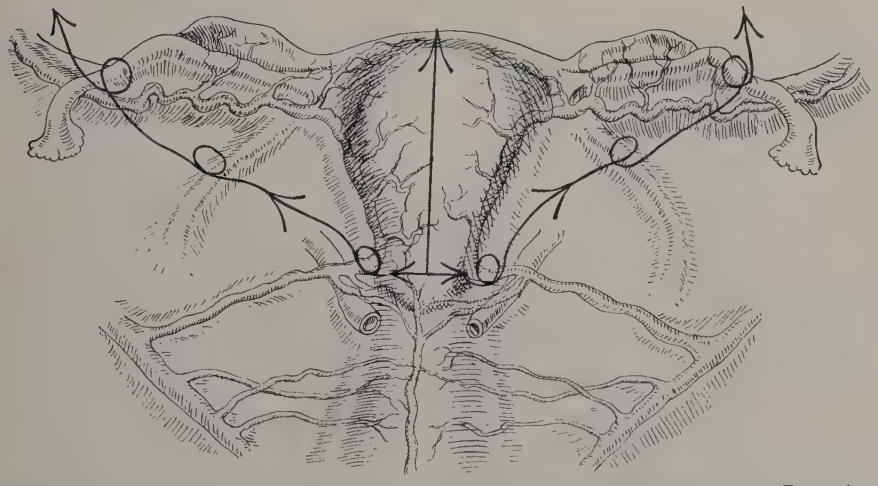


Fig. 6040.—Scheme of Ligations and Direction of Incision in Supravaginal or Total Abdominal Hysterectomy _ by Transverse Division of the Cervix or Vagina, Followed by Median Vertical Bisection of the Uterus, from Cervix to Fundus, and by Division of the Broad Ligaments from Below Upward.

(*c*) Abdominal Total Hysterectomy _ the excision of the entire uterus, including the cervix. Sometimes called complete hysterectomy or panhysterectomy.

(*d*) Radical Abdominal Hysterectomy for Uterine Malignancy – consists in the total removal of the uterus plus the thorough excision of the parametrial

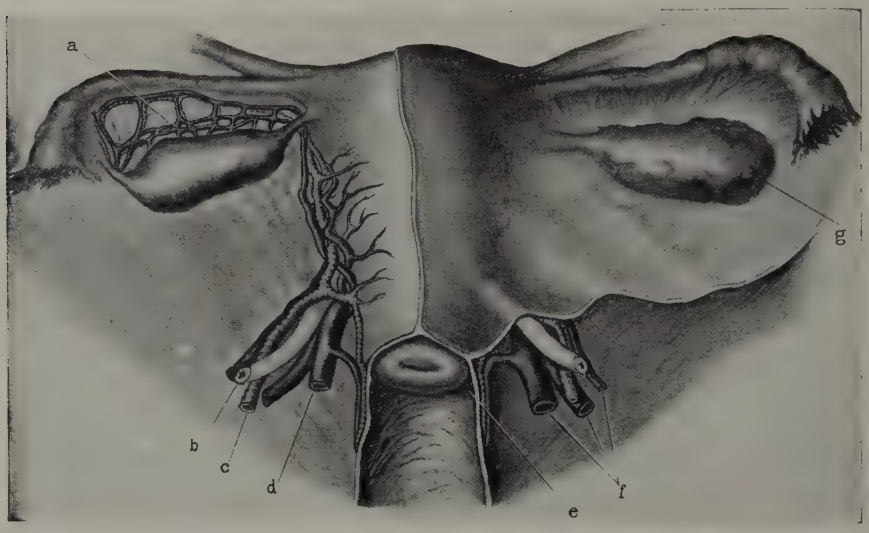
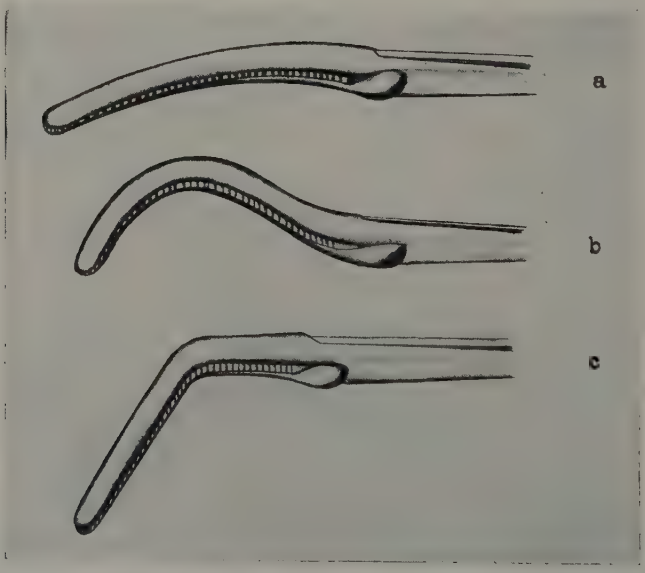


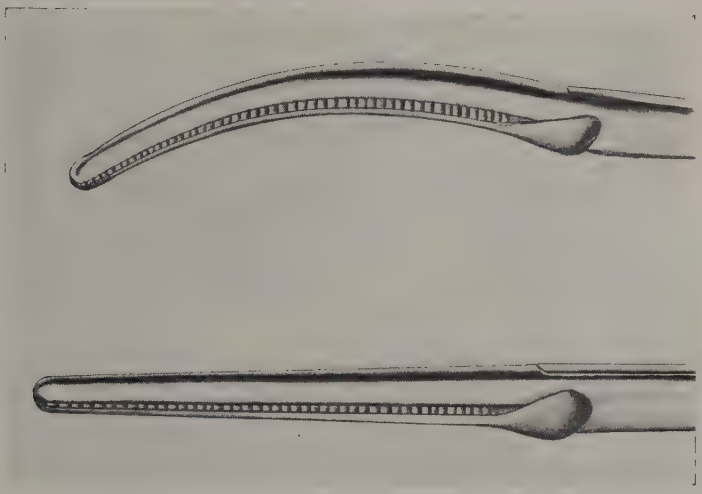
Fig. 6041.—Diagrammatic View of the Relations of the Vessels of the Uterus, Appendages, and Ureters, Seen from Behind: – a, Ovarian vessels and lymphatics; – b, ureter; – c, uterine artery; – d, uterine vein; – e, vaginal branches of uterine artery and vein; – f, uterine and broad ligament veins; – g, ovary. (Modified from Liepmann.)



Figs. 6042–6044.—Uterine Clamps: – a, Medium curved; – b medium crooked; – c, medium angular.

(broad ligament) and adjacent lymphatic tissues and appendages (tubes and ovaries). The technic includes the most complete and radical removal of these structures practised.

Total hysteromyomectomy is not a special type of operation – but only the application to myomatously involved uteri of the technic carried out in total hysterectomy, performed by one of the first three methods mentioned above – accomplished by one of the methods of section about to be described.



Figs. 6045 and 6046.—Uterine Clamps; – Long curved and long straight.

General Methods of Section in Abdominal Hysterectomy.—As far as the mechanical features of excising the uterus is concerned this, in the first place, must resolve itself into either supravaginal or partial hysterectomy – or a total hysterectomy.

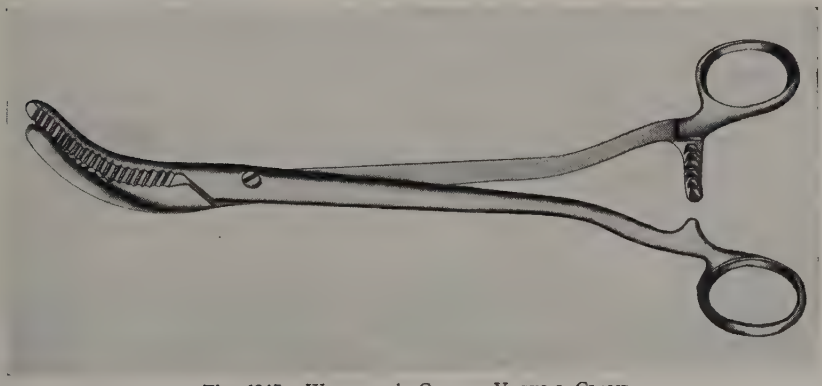


Fig. 6047.—Wertheim's Curved Vaginal Clamp.

In the next place the excision may be of the uterus alone – or of one or more of the appendages – including or excluding them in the general excision, as may be indicated.

Finally, the uterus can only be removed from its lodgment by some form of circumventing incision or some combination of incisions. These incisions may be variously placed – and their placing is largely dependent upon, and is generally planned to meet, the special physical features of the individual cases – to enable the indicated excision of structures to be mechan-

ically carried out in the most advantageous manner. Some of these methods of carrying the incisions and placing the ligatures to control the vessels supplying the parts excised are here illustrated _ in their general applications to abdominal hysterectomy at large. All of the illustrations represent the total removal of the uterus (body and cervix) _ as well as the removal of the ap-

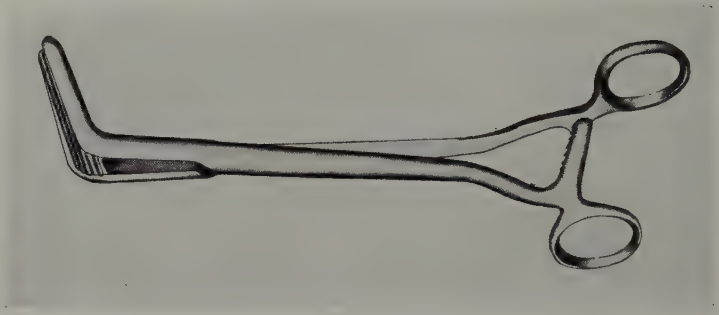
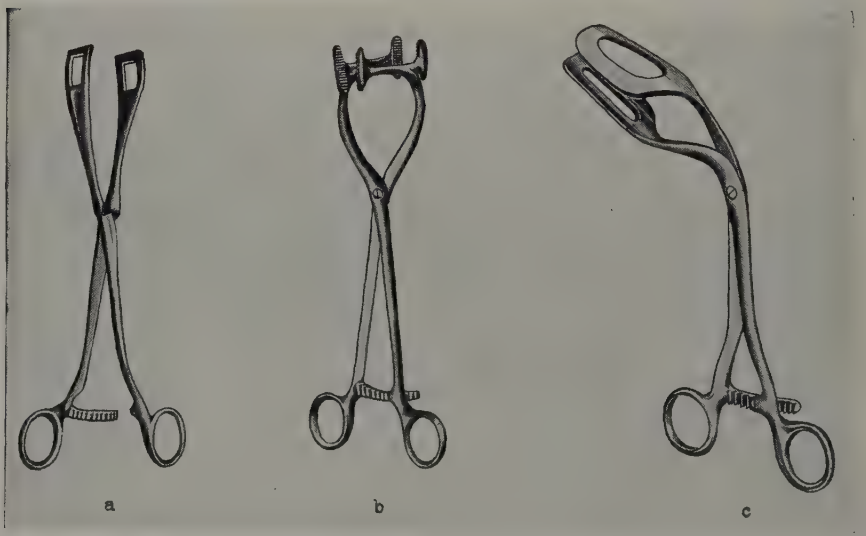


Fig. 6048.—Wertheim-Collin's Vaginal Clamp.

pendages and a portion of the parametrium (ovaries, tubes, and part of the broad ligaments). The *direction* of the incisions would be the same whether the excision were supravaginal or total _ but the *position* would, necessarily, differ, as to whether one of more of the appendages were to be included with or excluded from the excision of the uterus _ and as to whether the excision were going to exclude (be supravaginal) or include the cervix (be total).



Figs. 6049–6051.—Uterus-holding Forceps: a, Cullen's; _ b, Daels'; _ c, Perry's.

In all of those procedures where the appendages are to be preserved the lines of ligation will, naturally, be placed more central (that is, include the booood-supply between the uterus and the appendages rather than be to their outer side). Illustrations of some of the possible combinations of incision are seen in Figs. 6036–6040. The application of these incisions will be given in de-

tail in the descriptions of the various methods of removing the uterus which follow — together with their chief indications.

General.—Among the problems concerned in abdominal hysterectomy it may be said, in a general way, that those which usually give the most concern are: hemorrhage control — the avoidance of the ureters — and the separation of adhesions — and, in the radical operations for malignancy, the removal of lymphatic structures.

The general relationships of the vessels and the ureters to the structures involved in the operations are shown in Fig. 6041.

A comprehensive view of the lymphatics of the female organs — of special importance in the radical operations — is seen in Fig. 6090.

As the clamp control of vessels in the broad ligament structures forms an essential feature in the operative technic of these cases, it is well to have a number of these of various forms on hand — such as shown in Figs. 6042–6052.

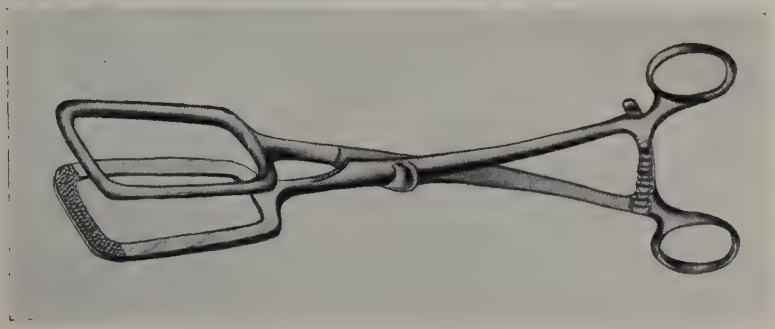


Fig. 6052.—Basil Hall's Clamp for Wertheim's Radical Hysterectomy.

Both the vaginal and abdominal fields should be prepared in advance — to cover both abdominal section and possible or certain vaginal invasion. The uterine cavity is swabbed with the tincture of iodin.

ABDOMINAL SUPRAVAGINAL HYSTERECTOMY — OF THE UTERUS TRANSVERSELY DIVIDED AT THE INTERNAL OS — EXCLUDING OR INCLUDING THE APPENDAGES

Description.—The excision of the uterus at the level of the internal os — without opening the vagina — and with or without excising ovaries or tubes. In those cases in which, in addition to the simple supravaginal hysterectomy, one or more ovaries or tubes, or both, are removed, the technic becomes a supravaginal hystero-oöphorectomy or supravaginal hystero-oöphoro-salpingectomy. The broad ligaments may, as is more usual, be freed *pari passu*, on the two sides down to the level of the internal os and the uterus be then divided at this level (v. Fig. 6036) — or the division of structures may begin at the free border of one broad ligament — pass down that ligament — divide the corporocervical junction — and then divide the opposite broad ligament from below upward (v. Fig. 6037) — or in complicated cases the uterus may be split, and each half be then freed separately (v. Fig. 6039) — or, also in complicated cases, the corporocervical junction may be divided, and then each half of the uterus be freed from below upward (v. Fig. 6040).

The partial excision of the uterus — that is, its division at the internal os — should always be chosen in non-malignant cases in preference to total hysterectomy whenever the cervix is not involved, and when the former procedure will cover the indications in the special case. Its special field of appli-

cation is in myomatously involved uteri, in those cases where the cervix is uninvolved, and where the level of the internal os is accessible – and in marked functional and inflammatory dysmenorrhea.

Preparation.—Bowels and bladder emptied. Lower abdominal and pubic wall shaved and disinfected. Vagina and uterine cavity prepared against possible invasion – the uterine cavity often being curetted and swabbed with the tincture of iodin.

Landmarks.—Lower median abdominal line – symphysis pubis – known position of bladder, ureters, and rectum.

Position.—Horizontal until the abdomen has been opened and the preliminary pelvic examination made – and then the Trendelenburg position –

Fig. 6053.—Abdominal Supravaginal Hysterectomy with the Preservation of the Appendages – I; – The uterus is displaced forward and to the opposite side – while ligatures are applied to the fallopian tube, at the ridge of the broad ligament, to the round ligament, upon the anterior aspect of the upper part of the broad ligament, and to the ovarian ligament, including the ovarian vessels, upon the posterior aspect of the upper part of the broad ligament.

or the Trendelenburg position from the first, enabling the intestine to fall away from the uterus. The Surgeon usually stands upon the patient's right during most or all of the operation – the Assistant, opposite.

Incision.—In the median infra-umbilical line – usually from 10 to 15 cm. (4–6 inches) in length – and, if necessary in difficult cases, extended upward around the umbilicus to the left, or through it and downward to the bladder

Operation by the Division of the Broad Ligaments Down Each Side, Followed by the Transverse Division of the Corporocervical Junction.—Having opened the abdomen in the median line, made the preliminary examination, and placed the patient in the Trendelenburg position, the uterus is grasped by holding forceps and drawn forward and the intestines allowed

to gravitate toward the diaphragm _ and are further held out of the field by hot-towel packing. Following the investigation made when the abdomen is opened it will have been determined whether the ovaries and tubes are to be preserved or sacrificed.

(*a*) If the appendages are to be preserved _ the uterus is displaced to the side opposite the one upon which the Surgeon elects to begin the freeing of the uterus _ and while thus steadied by uterus forceps, a separate ligature of fairly stout silk is carried by Reverdin needle beneath and around each one of the following structures in the upper part of the broad ligament (Fig. 6053): fallopian tube, ovarian ligament, and round ligament (which will include the ovarian vessels) _ placing each at such a distance from the uterus as to leave just safe room to divide the broad ligament to the medial side of the ligatures.

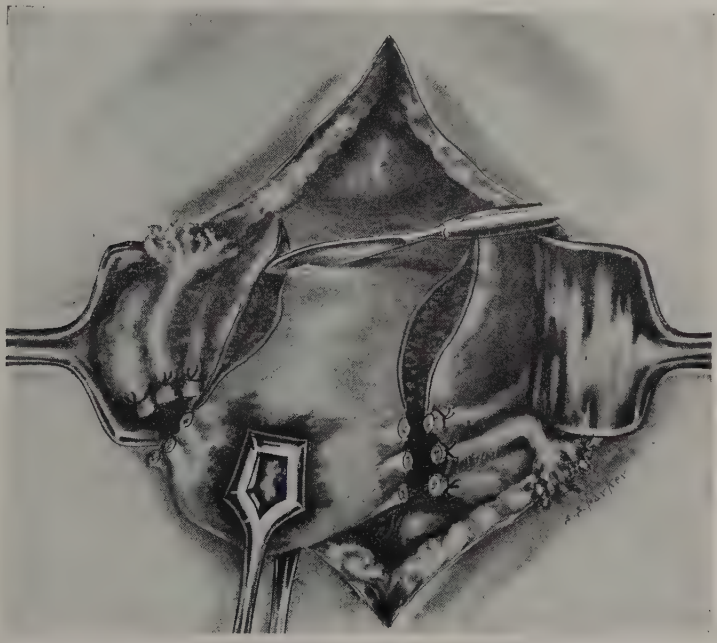


Fig. 6054.—The Same _ II; _ The ligated structures have been divided centrad _ and the broad ligament has been severed rather near to the uterus centrad to laterally placed ligatures as the division proceeds downward, down to the level of the internal os _ and, while the uterus is being held backward, the peritoneum is being divided in a transverse direction, with slight upward convexity, over the anterior corporocervical junction.

When the ligaments are tied their ends are left long. The broad ligament of that side is then divided rather close to the uterus _ leaving an ample amount of tissue centrad to the ligatures to keep them from slipping (Fig. 6054). The line of section of the broad ligament is carried on down along the uterus _ until the level of the internal os at the uterovesical fold of peritoneal reflection is reached _ at which level the direction of the incision is changed, and sweeps, with slight upward convexity, across the front of the cervix _ and similarly behind at the same level it also sweeps, with corresponding upward convexity, across the back of the cervix (Fig. 6055), carried lateroposteriorly with especial care and lightness so as to avoid cutting the uterine arteries and veins. These vessels will usually be sufficiently exposed in sweeping from the vertical to the transverse cuts to enable them to be underrun by a Reverdin needle and

ligature and tied – or at least temporarily clamped. One is especially to safeguard the ureters at this stage.

The structures of the opposite broad ligament are then similarly tied and divided – after which the uterus will retain connection with the body solely by its cervical connections.

The Surgeon then returns to the cervix and completes the division there – and in such a manner as to leave either an evenly cupped, concave surface upon the upper aspect of the cervix – or a transverse wedge-shaped aspect of the upper cervical surface – cutting, from the anterior corporocervical junction downward and backward – and from the posterior corporocervical junction

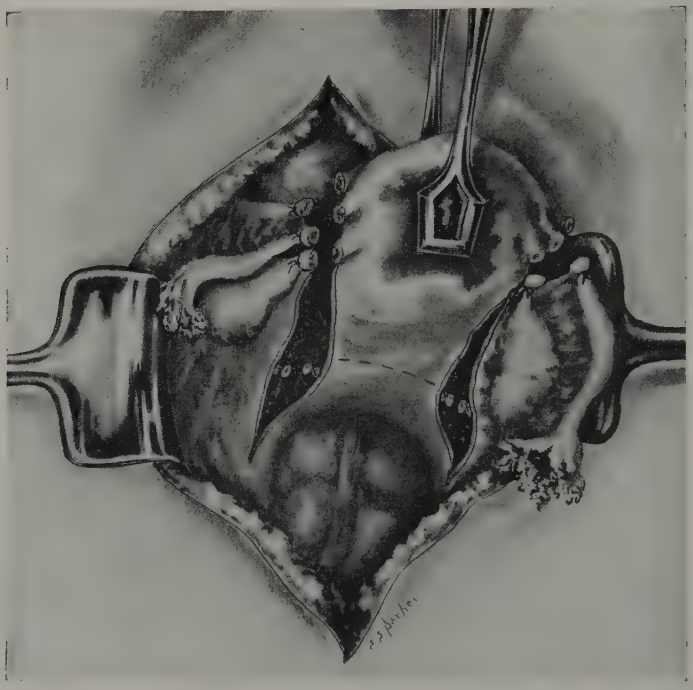


Fig. 6055.—The Same – III; – The uterus is now being displaced forward, and a corresponding posterior cervical flap of peritoneum, with upward convexity, will be incised from the posterior corporocervical junction – beginning and ending upon its lateral aspects, in common with the anterior peritoneal flap. Unless the peritoneum have been very lightly (superficially) divided up to this stage, it will be necessary to control the uterine vessels by ligature or clamp – otherwise this control may be left as a distinct step. It is best to underrun with a Reverdin needle and ligature and tie them at this stage, as they are exposed in dissecting back the cervical flaps of peritoneum.

downward and forward. Just as soon as the uterine mass is removed (and the cervical stump must be first lightly clamped to keep it from dropping into the vagina) the uterine vessels, if they have been previously only clamped, are now securely tied. It is to be remembered that the most important source of future possible hemorrhage are the uterine vessels – and next in importance the ovarian vessels – making four sets of possible bleeders. When the excised mass is removed careful review is made of the raw field – and any detectable vessel is picked up with artery clamp and tied with chromic catgut or silk. If any of the ligatures placed upon the principal vessels earlier in the operation appear insecure or insufficient, they are reinforced or entirely replaced by others.

The next step in the operation is to suture the anterior and posterior peritoneal flaps, which were provided in the transversely convex incisions over the front and back of the cervix, over the stump of the cupped or wedge-cut cervix. From the moment the cervix is severed special care is taken against the infection of the pelvic cavity through the now opened cervical canal. Irrespectively of whatever preliminary preparation of the uterovaginal tract may have been made, the cervical canal exposed in the stump may be cauterized – and packed with a small strip of gauze, flush with the upper opening of its canal, and extending below into the vagina – to be subsequently removed. The anterior flap of cervical peritoneum is now sutured to the posterior flap of cervical peritoneum, over the raw surface of the cervix – which has been held in the field during the suturing by small clamps which grasp the mus-

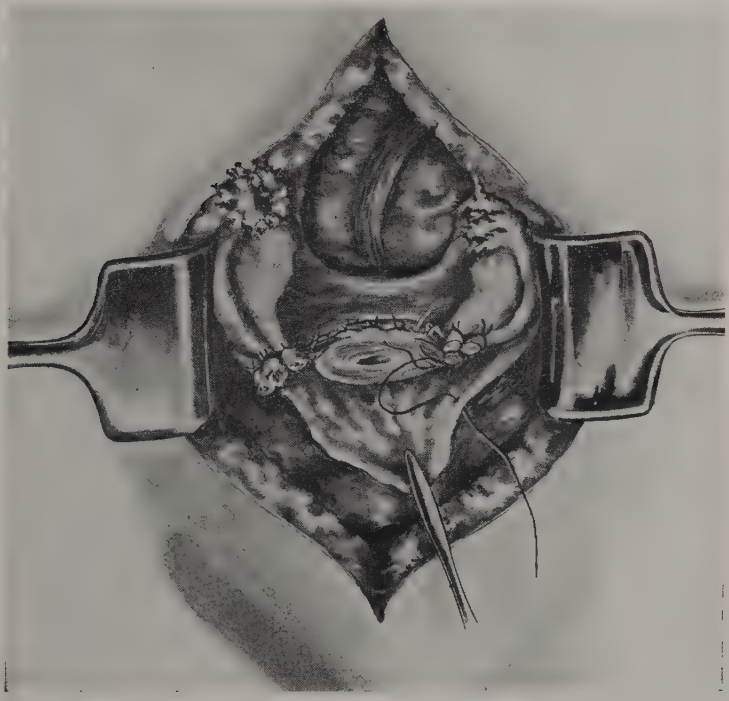


Fig. 6056.—The Same – IV; – Closing the cervical stump – and bringing together the margins of serosa over the entire wound bed. The preserved ovaries and tubes are seen.

culature of the part only between the serosa and mucosa (Fig. 6056). This suturing of the peritoneal flaps over the cervix usually includes in its more lateral aspects the burying in of the stumps of the ligated uterine vessels beneath the peritoneum. The margins of the peritoneal flaps immediately in front of and behind the uterine vessels may be brought together by a mattress suture, which will, besides uniting the peritoneal margins, have the effect of reinforcing these important ligatures.

The final step in closing the uterine wound bed consists in bringing together by chromic catgut suture or silk the margins of the anterior and posterior leaves of the peritoneum cut in the earlier stages of the operation – from the highest ligature (that of the tube) of one side – to the corresponding site upon the opposite side – the suturing of these margins of cut peritoneum

together, also burying in the ligated stumps of the various vessels – the stumps of the tubes, ovarian ligaments, and round ligaments on the sides – and the margins of the anterior and posterior cervical peritoneal flaps over the independently sutured-together stump of the cervix. When this has been accomplished no raw surface will be left within the peritoneal cavity (Fig. 6057).

In conclusion, the pelvic cavity is again examined and dried – the patient lowered to the horizontal – and the abdominal wound closed in the usual manner.

(*b*) If the appendages are to be included in the supravaginal excision the operation will only differ from the preceding insofar as concerns the more outward placing of the upper ones of the broad ligament ligatures. The first ligature will include the free border of the indundibulopelvic

Fig. 6057.—The Same – V; – The completely sutured intrapelvic wound bed. The pedicles of the ovaries, tubes, and round ligaments are buried between and under the sutured margins of pelvic peritoneum.

ligament, controlling the ovarian vessels, placed to the outer side of tube and ovary (Fig. 6058). And the following ligatures will be carried through the broad ligaments in a downward and inward direction – until by the time they have reached the corporocervical junction of the uterus they occupy the same position as just described in the preceding technic. The open gap in the broad ligament by this wider excision of parts is, naturally, more extensive. All of the dealings with the lower part of the structures, including the ligation of the uterine vessels and the transverse division of the cervix at the level of the internal os, are exactly the same as in the method just described.

Operation by the Division of the Broad Ligament Down One Side, Followed by the Transverse Division of the Corporocervical Junction – and the Upward Division of the Broad Ligament on the Opposite Side.—

The presence of adhesions may make impossible the carrying out of the procedure just described – so that instead of adopting an extreme measure, such as hysterectomy by bisection (v. p. 649), a compromise measure between that and the preceding technic may be adopted – namely, the downward ligation and division of the broad ligament upon one side – the exposure and ligation of the uterine vessels of that side – followed by the transverse division of the uterus at the level of the internal os – and the immediate ligation of the uterine vessels upon the opposite side, just as soon as the uterine tissue of that side is severed and the connective-tissue plane opened up in which the uterine vessels course. With one side and the cervix free, the still fast side is carefully freed, ligated, and divided – from the cervix upward – unless by the freedom thus gained the rest of the operation may be carried on from above downward on the second side.

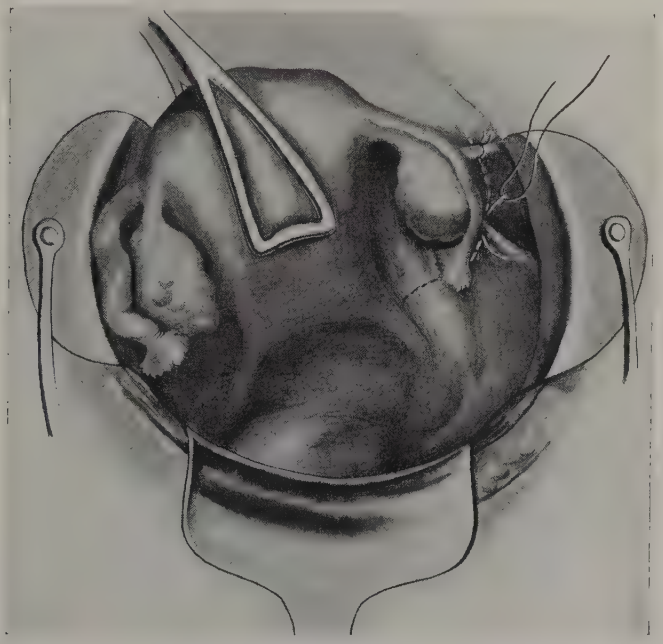


Fig. 6058.—Abdominal Supravaginal Hysterectomy with the Excision of the Appendages – I; – The ligation of the free border of the infundibulopelvic ligament, including the ovarian vessels – following which the ligation of the round ligament and the segments of the broad ligament will take place a little further outward than in the retention of the appendages – until the lower portion of the uterus is reached.

Comments.—One should not cut too closely to the uterus in severing the broad ligaments, as considerable branches of the uterine arteries are apt to be cut, which may cause troublesome hemorrhage.

After dividing the round ligaments the leaves of the broad ligament tend to open up, and, following in this cleavage line toward the corporocervical junction, one comes upon the uterine vessels.

It is often well to expose the uterine vessels at sufficient length to enable double ligatures to be placed upon them.

It is of practical importance to so anchor the cervical stump so that it will not tend to prolapse into the vagina – an occurrence which has been held responsible for a series of nervous symptoms following hysterectomy. Various

technics of suture in the final steps of the operation are usually resorted to for the purpose of anchoring the upper raw aspect of the divided cervix. One of the methods of accomplishing this is by means of suturing the cervical margins and the peritoneal borders in the manner described in the body of the present article. Another method is to anchor the stumps of the infundibulopelvic, broad, and round ligaments into contact with the cervical stump by suture – finally covering all raw surfaces by margins of sutured-together peritoneum. In this latter technic the cervical stump is largely suspended, as it were, by being sutured to these broad ligament structures on each side.

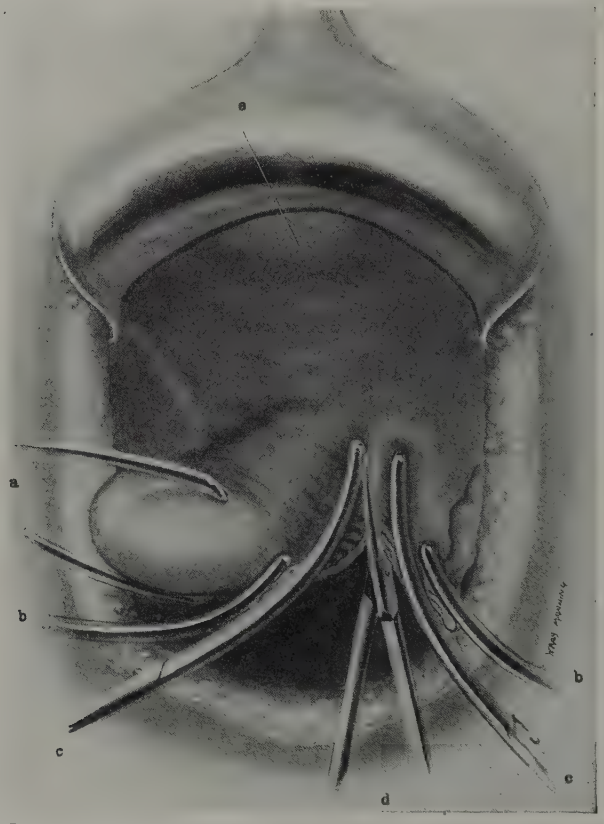


Fig. 6059.—Clamp Control of the Broad Ligaments During Their Division in Hysterectomy, Either Internal to or External to the Appendages – I: – **a**, Tractors, drawing the uterus to the opposite side; – **b, b**, clamps, controlling the upper parts of the broad ligaments – which scissors, **d**, have divided, between the clamps, as far down as the first pair of clamps is applied; – **c, c**, lower clamps controlling the lower aspect of the broad ligaments – between which scissors are in the act of cutting; – **e**, bladder. The patient is in the Trendelenburg position.

If there be any reason for instituting temporary drainage of the pelvic peritoneum, this is provided for while the abdomen is open by cutting through the recto-uterine peritoneal reflection upon the separated ends of a pair of long, curved dressing forceps, introduced through the vagina – whose upper ends then bulge prominently into the bed of the wound – and the blades of which close upon a "cigarette" or rubber-tube drain, and draw it into the vagina, where it will be anchored.

If extensive adhesions of uterus, tubes, and ovaries exist, the chief diffi-

culties in the operation may arise more from these conditions than from the routine technic itself – as explained in Abdominal Hysterectomy (Supravaginal and Complete) by Bisection (v. pp. 656–667).

The bladder is retracted well forward during work upon the anterior aspect of the uterus – and the rectum well backward, while freeing the posterior uterine wall.

In ligating the uterine vessels be especially careful not to carry the aneurysm needle too deeply alongside of the cervix – for fear of including the ureters. One is aided in ligating these vessels, and in avoiding the ureters, if the uterus

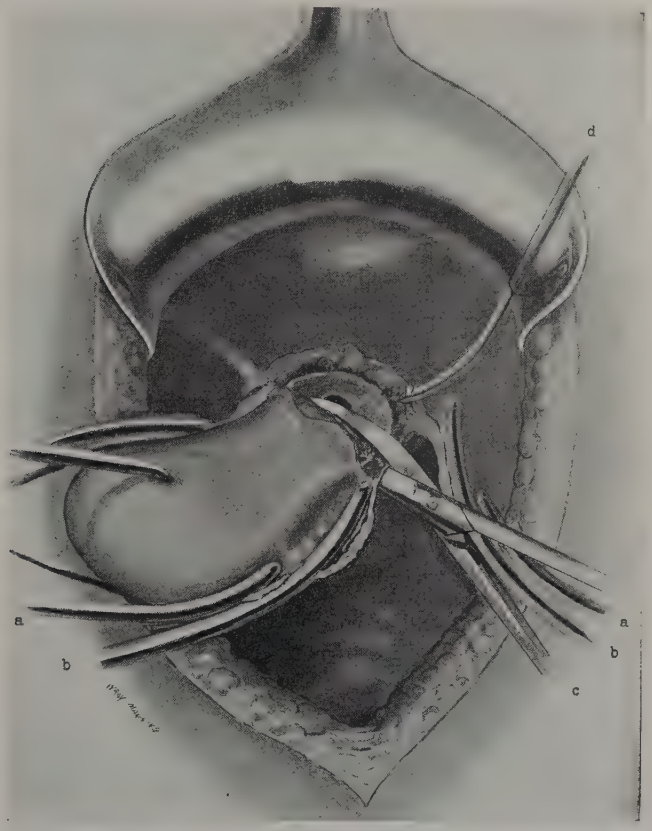


Fig. 6060.—The Same – II; – Division of the cervix at the internal os after clamping and dividing the broad ligaments' structures and uterine vessels preparatorily to tying them: – a, a, Upper clamps of the divided broad ligaments; – b, b, lower clamps; – c, division of the cervix at the level of the internal os; – d, clamping the proximal end of the uterine artery.

be drawn well to the opposite side of the one upon which the work is being done.

When the structures are removed a crescent-shaped, denuded area is left in the pelvic cavity, broadest at the center, opposite the cervical stump, and coming to points at the brim of the pelvis on each side where the ovarian vessels were tied.

The lips of the cervical stump are sometimes sutured together alone and independently, and then the margins of the adjacent vesico-uterine and recto-uterine peritoneum sutured to the cervical stump and to each other.

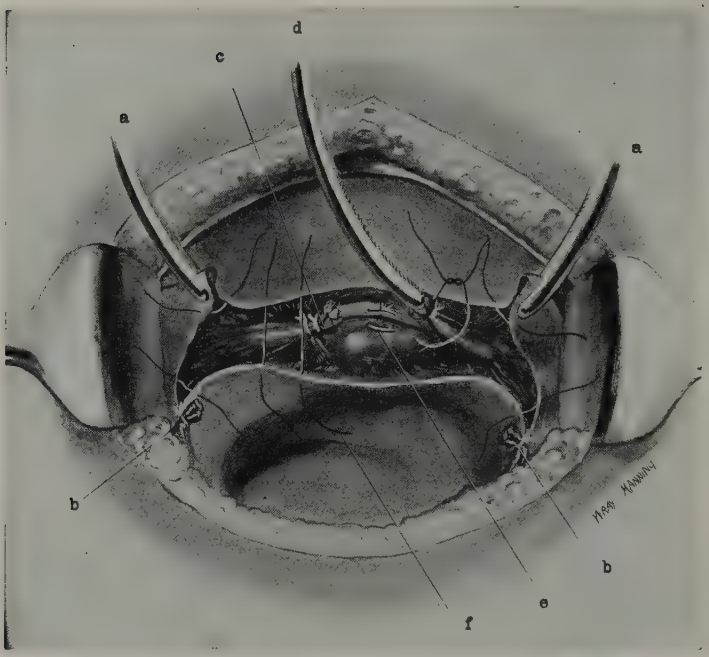


Fig. 6061.—Anchoring the Vascular Stumps to the Cervical Pedicle in the Act of Closing the Latter: – a, a, Clamps upon the round ligaments; – b, b, ligated ovarian vessels and upper aspects of the broad ligaments; – c, ligated right uterine vessels included within one of the lateral sutures of the cervical stump; – d, ligated left uterine vessels about to be included in a similar ligature; – e, mattress-suture closing in the cervical stump; – f, suture of the peritoneum over the wound in the floor of the pelvic cavity.

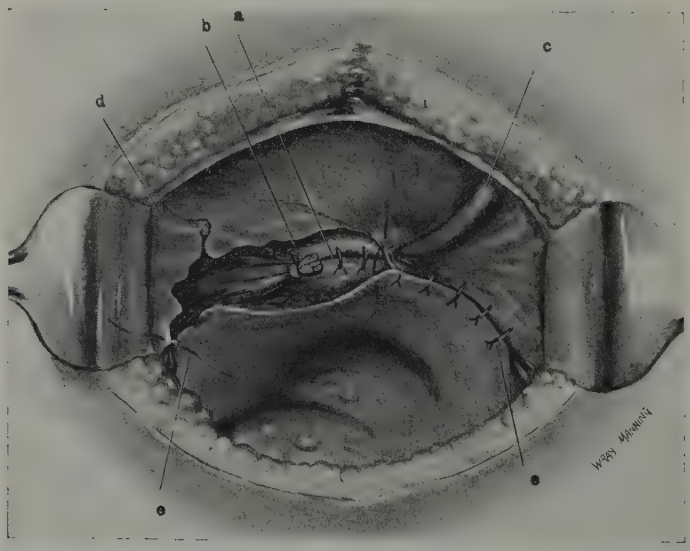


Fig. 6062.—The Same; – Continuation of the suturing of the margins of the peritoneum over the pelvic wound bed: – a, Sutured cervical stump; – b, ligated uterine vessels; – c, right round ligament sutured into the lateral aspect of the cervical stump in the act of closing the latter and suturing the peritoneum over it; – d, left round ligament; – e, e, peritoneal sutures.

Clamps are sometimes used to first control the broad ligament structures on the two sides _ instead of proceeding to systematically ligate these structures at once and then dividing them. Two sets of clamps are thus employed _ one pair of forceps being placed mediad and the other laterad over the free borders of the broad ligaments. The broad ligament is then cut between these first-applied clamps _ whether excluding or including the appendages (Fig. 6059). The halves of the cut broad ligament then gap _ and a second set of clamps is similarly applied _ and the ligament further divided between them. The second set of clamps will usually carry the division down to the level of the internal os. At this level the cervical peritoneal flaps are made _ and the cervix divided by knife or scissors in cupped-out fashion (Fig. 6060). Ligatures are then applied to the flaps _ and the clamps removed.

In Fig. 6061 is seen the method of, first, ligating the uterine vessels, and then anchoring the ligatured stumps of these vessels to the cervical stumps in the act of suturing together the opposite lips of the cupped-out or wedge-cut cervix. In Fig. 6062 one of the stumps of the vessels on the left is seen anchored to the closed cervix _ and on the right the peritoneum has been sutured over the opposite vascular stump anchored to and incorporated in the sutured cervix.

ABDOMINAL SUPRAVAGINAL HYSTERECTOMY OF THE BISECTED UTERUS, EXCLUDING OR INCLUDING THE APPENDAGES

KELLY'S TECHNIC

Description.—The body of the uterus is excised at the level of the internal os _ without opening the vagina _ and with or without also excising the ovaries or tubes _ but in order to carry out the details of the excision, which are usually more than ordinarily difficult, the body of the uterus is split from the fundus to the level of its division at the internal os. The special indications for the supravaginal excision of the uterus by the method of bisection are usually such conditions as extensive and more or less massive adhesions, complicating uterine tumors, pus-tubes, and in general conditions of infection or adhesions which have so matted and bound together and confused the parts that the individual structures are difficult or impossible to recognize and more difficult to separate and remove. In order, therefore, to gain access to the involved structures instead of proceeding to first tie off the contiguous structures and then enucleate the uterus from without inward the uterus, is first split medially from fundus to the level of its division at the internal os, and then each half is enucleated from within the median line outward and from below upward _ finally tying off the important structures and vessels as these are reached _ and then severing each half of the uterus from its connections. The following description and illustrations are summarized from Kelly's work. The organ may be bisected either from above downward _ or from below upward.

Preparation _ Position _ Landmarks _ Incision.—As in the usual supravaginal hysterectomy just given.

(*a*) **Supravaginal Hysterectomy by Bisection of the Uterus from the Fundus Downward** _ Kelly.—The method is here carried out in the presence of _ and because of _ extensive adhesions and organized exudate welding the adjacent structures into a more or less indeterminate mass _ with or without localized pus collection or infection.

The abdomen is opened in the manner just described _ and the pelvic cavity reconoitered to the best extent possible _ which in these cases is usually limited. The uterus and appendages may be so submerged and bound down

as to be scarcely recognizable. The general peritoneal cavity is well packed off _ and if any pus collections are present, these are carefully evacuated by aspiration or by limited incision or puncture. The bladder may be adherent to the rectum and the fundus of the uterus may not even be found until after the adhesions between the bladder and rectum have been separated _ and this must be done with unusual care that neither hollow viscus may be torn into.

When room for manipulation has been thus secured each cornu of the uterus is seized with stout vulsellum forceps of the Museaux type (Fig. 6063). While the uterus is drawn upward by these the fundus of the organ is divided

Fig. 6063.—Supravaginal Hysterectomy by Bisection of the Uterus from the Fundus Downward _ Kelly _ I: _ a, a, Vulsella grasping the lateral aspects of the fundus, which is divided medially between them; _ b, bladder; _ c, rectum. Extensive, massive adhesions and pus-tubes, d and e, are seen in the field.

in the median line by knife from above downward _ and preferably down the anterior wall if one wall must be divided at a time. The halves of the uterus are drawn still further upward _ and apart _ *pari passu* with the downward extension of the median bisection. While the halves are held in this secondray position by the original Museaux clamps, a third pair of clamps is slipped down in the median line, and seizes both anterior and posterior walls of the divided uterus on one side as low as the division _ when the original Museaux of that side is removed _ after which the same procedure is carried out with the opposite side _ until finally each half of the partly divided uterus has been seized at a level just above that at which the body of the organ is about to

be severed from the cervix (Fig. 6064). At first three and then two pairs of clamps are kept constantly in operation – and usually three or four shifts are made in their grasps between the fundus and the level of the internal os – each half of the uterus being further drawn upward and everted as the section progresses. After the cavity of the uterus has been once entered in dividing the fundus it is kept in view as a guide in the section – and if lost, is found by passing a sound or a grooved director from the opened fundus downward. When the level of the internal os has been reached and one-half of the partly divided uterus has been firmly grasped by the clamp just above this level,

Fig. 6064.—The Same – II: – a, Clamp forceps approximating the anterior and posterior walls of the right half of the uterus, bisected, and transversely divided at the internal os; – b, clamps holding the opposite bisected but yet unfreed half; – e, e, right uterine artery ligated and divided; – d, left uterine artery in its connective-tissue bed; – c, c, ligated round ligament.

that half is transversely divided at the junction of the body with the cervix – proceeding by knife or scissors to cut from the median line outward – cupping or transversely grooving the upper aspect of the cervical stump which is to remain during the section – and proceeding with extreme care as the outer limits of the uterus are approached. As this point is reached and while the half of the body of the uterus is drawn upon by the clamp and separated from the vaginal portion, the important uterine vessels of that side come into view – especially if the lowermost clamp of that side be shifted to the very end of the divided half, which is then carefully rolled upward and outward – exposing the vessels beneath and just to the outer side of the half-stump.

When the vessels come into the field they are further exposed by dissection and securely ligated by double ligatures as they course upward, and then divided between the ligatures (v. Fig. 6064).

The half of the uterus thus largely freed is now still further drawn upon, but in a somewhat different direction – so as to give access to its outer aspect – and during this exposure from below upward, on the outer side of the uterus, the round ligament is first tied and divided in traversing the broad ligament of that side outward – and then the structures of the upper part of the broad ligament are ligated between the cornu of the half of the uterus which is being

Fig. 6065.—The Same – III; – The denuded pelvic bed, surrounded by the divided structures of the broad ligaments, following removal of the uterus: – a, a, Ligated pus-tubes; – b, b, ligated round ligaments; – c, c, ligated uterine vessels; – d, cupped, transversely divided cervix uteri.

separated, and the mass of tubo-ovarian structures divided (or, if necessary, are clamped first, then divided, and finally tied) – after which that half of the uterus is removed. The same steps are then carried out upon the opposite side. The final appearance of the wound upon the removal of the two halves of the uterus is as seen in Fig. 6065.

At this stage the remaining contents of the pelvis are examined – especially as to the integrity of the bladder and rectum. If the neck of the uterus have been closely hugged in exposing and ligating the uterine vessels the ureters are reasonably safe. The bed of the pelvic wound and the broad ligament stumps are carefully examined.

Where the operation has started out to consist of the removal of the uterus and of the ovaries and tubes, but where these latter cannot be at first included in the removal, then after the uterus has been first removed the appendages often hitherto hidden and masked by adhesions will now come into the field, where they may generally be removed by detailed dissection _ with careful hemostatic ligation of their often vascularized beds of organized exudate.

It is preferable where possible to remove the tube and ovary of each half along with that half of the bisected uterus _ rather than by separate enucleation, as just described.

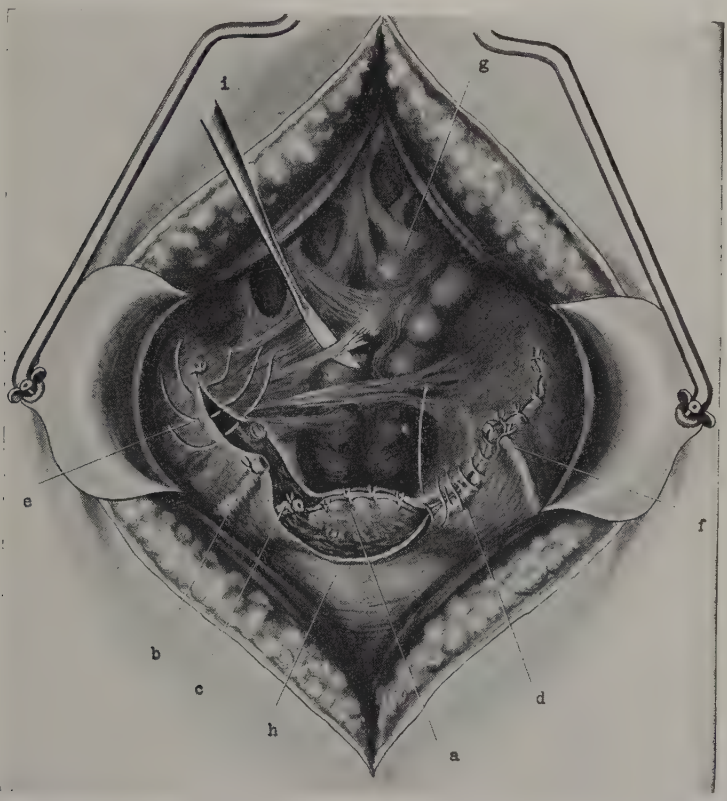


Fig. 6066.—The Same _ IV; _ Closure of the wound bed: _ **a,** Lips of the cervical stump united by interrupted sutures, which will, in turn, be buried by approximation of the peritoneal margins; _ **b,** ligated round ligament; _ **c,** ligated uterine artery; _ **e,** closure of the outer part of the broad ligament from which a pus-tube has been removed; _ **d,** closure of the peritoneum over the round ligament and cervical stumps, and between by continuous suturing (here of the Lembert type); _ **f,** anchoring the left round ligament stump in the peritoneal suture line; _ **i,** separation of peritoneal adhesions; _ **h,** bladder; _ **g,** rectum.

In concluding the operation the opposite margins of the cupped-out surface of the cervix are brought together by suture _ in the accomplishment of which the ligated stumps of the uterine vessels may be anchored to the sides of the cervix _ and the broad ligament stumps are included in the closure of the cervical wound and in the suturing of the margins of the peritoneum, so as to aid in retaining the cervical stump in position (Fig. 6066).

If pus-pockets have been opened during the manipulations or the case be one in which drainage is indicated, this is usually accomplished through a puncture made in Douglas' culdesac.

(*b*) **Supravaginal Hysterectomy by Bisection of the Uterus from the Cervix Upward** _ Kelly.—Instead of proceeding in the bisection of the uterus from the fundus to the level of the internal os, as just described _ and as is easier and preferable _ it will sometimes happen that the adhesions in the special case _ especially the posterosuperior adhesions to the rectum _ may be such as make access to the fundus of the uterus difficult or impossible _ the uterus being, as it were, plastered to the posterior pelvic wall. As removal of the uterus in such cases may be impossible _ and bisection from the fundus almost equally so _ one may only be able to begin the disembedment of the uterus at its cervical aspect. This is sometimes accomplishable by seizing the anterior aspect of the cervix through its peritoneal covering by one pair of

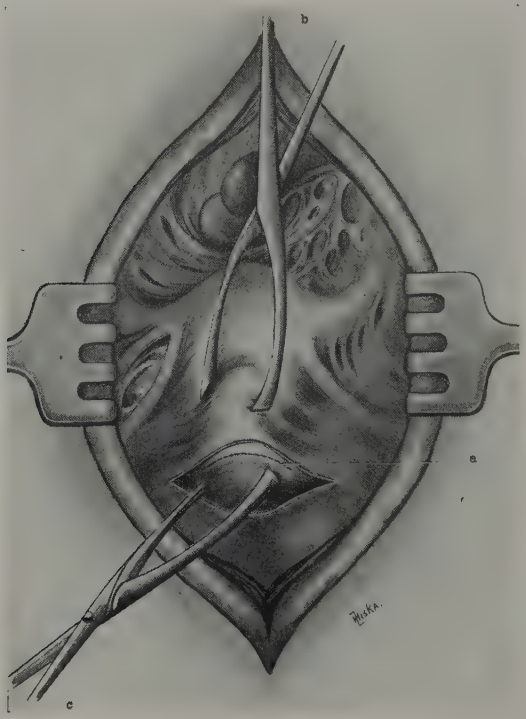


Fig. 6067.—Supravaginal Hysterectomy by Bisection of the Uterus from the Cervix Upward _ Kelly _ I; _ Dense adhesions are here binding the uterus posterosuperiorly: _ **a,** Transverse incision at the level of the internal os, through which the uterine vessels are exposed and ligated and the uterine cavity exposed; _ **b,** vulsellum grasping the body of the uterus; _ **c,** vulsellum seizing the cervix.

Museaux's clamps _ and the body of the uterus, just above, by another _ and then transversely dividing the peritoneal covering and the anterior wall of the cervix at the level of the internal os (Fig. 6067). This section extends far enough laterally to expose the uterine vessels, which are securely tied as they course up along the cervix. But in passing through the anterior uterine wall the section does not pass at this stage beyond the uterine cavity. One blade of a pair of stout scissors is then slipped through this incision into the uterine canal _ and divides the anterior wall in the median line to the fundus. After this median division of the anterior wall the two cut borders of the uterine halves are seized with Museaux clamps _ which then practice a combined outward rolling and upward traction upon the halves. While this is

being done the posterior aspect of the cervix is transversely divided – thereby transversely separating the body of the uterus from the fundus. When this has been accomplished a broad, substantial grooved director is carried by blunt dissection behind the posterior wall of the uterus, closely hugging wall. By this close following of the posterior wall of the organ and by cutting through the posterior wall in the median line at the end of each limited progress of the grooved director by scissors, one blade of which has been carried along the director (Fig. 6068), the rectum is safeguarded as well as it can be in these difficult cases. If it were impossible to follow up the posterior wall with a grooved director, an alternative would be to cut through the posterior wall from within the uterine cavity outward – trusting to recognizing the cleavage line between uterus and adherent rectum when reached. A second alternative

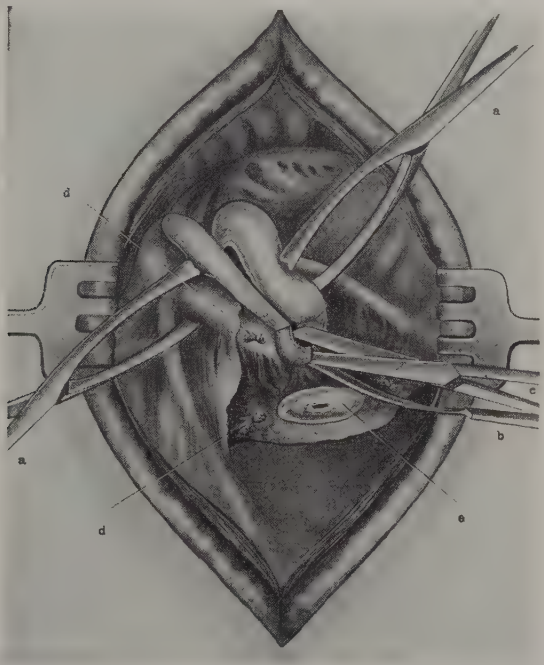


Fig. 6068.—The Same – II; – The uterus, transversely divided at the cervix, is now split medially upward: – a, a, Vulsellum forceps retracting the two halves; – b, grooved guide hugging the posterior wall of the uterus – upon which the scissors, c, are dividing the posterior uterine wall; – d, d, ligated and divided uterine arteries; – e, divided cervix.

would be to work around the outer aspect of each half of the uterus to the posterior median line – tying off the structures of the broad ligaments as encountered on each side.

Having freed and removed the two halves of the uterus, all of the remaining steps of this form of the bisection operation are the same as just described under the more commonly practised type of the operation.

Comments.—In some cases, especially of infection, it may be indicated to remove the mucosa of the cervical stump before closing the upper aspect of the latter. When this is the case, the opposite walls of the cervical mucosa are pinched together by clamp forceps (a narrow pair of pile-grasping forceps serving the purpose well) and drawn outward – while narrow, curved scissors dissect away the mucosal lining of the cervical canal (Fig. 6069).

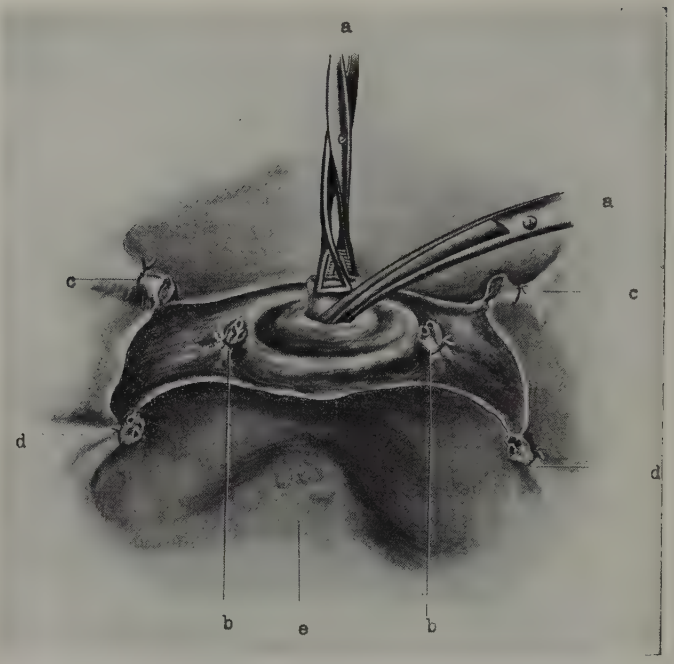


Fig. 6069.—Excision of the Cervical Mucosa in Supravaginal Hysterectomy: _ a, a, Dissection of the drawn-out cervical mucosa from the transversely divided cervix; _ b, b, uterine vessels; _ c, c, round ligaments; _ d, d, ovarian vessels; _ e, rectum.

TOTAL ABDOMINAL HYSTERECTOMY, WITH OR WITHOUT THE REMOVAL OF THE APPENDAGES

Description.—In complete abdominal hysterectomy the entire uterus is excised. The removal of the intact organ may be carried out _ or, in cases where certain difficulties present themselves, such as extensive adhesions, the uterus may be first bisected and its bisected halves excised. Further, the uterus alone may be removed _ or, along with its removal, one or more of its ovaries and tubes may also be excised.

Still further, the uterus may be excised by a methodic division, *pari passu*, of the structures of the broad ligaments on each side _ from the upper free borders of the broad ligaments down to and into the vault of the vagina _ which is the method of choice in cases where it can be carried out (v. Fig. 6036, p. 633). Or the removal may be accomplished by a combination method _ in which the organ is first removed supravaginally "from left to right" (v. Figs. 6037, 634) _ down the left broad ligament _ transversely amputating at the corporocervical junction _ up the opposite broad ligament _ followed by excision of the detached cervix.

Even other variations of technic are in practice _ some of which will be briefly given toward the close of the description.

The chief indications for panhysterectomy are such conditions as the following: _ such cases of uterine disease or involvement as call for the supravaginal removal of the uterus, but in which, in addition, the cervix is markedly involved, and not likely to recover even after the removal of the body of the uterus (which, however, it often does) _ some cases of uterine fibroids and fibrosis, and of fibroids of the cervix (v. hysteromyomectomy, p. 667) _ cases

of malignancy, its special field, but here the removal is much more radical than of just the uterus alone (v. Radical Hysterectomy for Malignancy, p. 679) _ extensive involvement of the appendages _ uterine infection. Some Surgeons prefer to remove the entire uterus even in those cases where others may choose a supravaginal excision.

Preparation _ Position _ Landmarks _ Incision.—As for supravaginal hysterectomy (v. p. 639). The intravaginal and intra-uterine preparation should be thorough _ either curetment and the application of the tincture of iodin to the uterocervical canal, and the tincture of iodin to the vagina _ or simply the tincture of iodin to the entire utero-cervico-vaginal tract _ following preliminary preparation. This is so because of the necessity of entering the vagina from the peritoneal cavity. If the uterine cavity be infected, the cervix should be closed by suture before the excision.

(*A*) **Total Abdominal Hysterectomy of the Intact Uterus, With or Without the Appendages _ by the Downward Division of the Broad Ligaments.**—The earlier steps of the operation are precisely the same as those carried out in the supravaginal excision of the uterus by the corresponding method (v. p. 639). The abdomen is opened in the median, infra-umbilical line _ the patient brought into the Trendelenburg position _ and the intestinal coils retracted toward the diaphragm. If examination should show moderate adhesions, interfering with the proposed manipulations, these are separated. If they prove too dense or extensive for this, some modified technic may have to be adopted. The uterus is conveniently handled during the operation by some form of snugly gripping uterine-holding forceps _ or in the grip of some form of volsellum forceps or Museaux clamps. Thus controlled, it is shifted from side to side, or from before backward, during the different stages. As a result of the intrapelvic examination it will have been determined whether the ovaries and tubes are to be included in the excision of the uterus or preserved.

If the appendages are to be preserved _ the uterus is drawn to the opposite side, away from the immediate field of operation _ and a separate ligature of silk or chromic catgut is carried around the fallopian tube and the ovarian ligament _ near enough to the uterus to conserve these structures, but still leave room to safely divide the broad ligament between the uterus and the ligatures (v. Fig. 6053, p. 640). The round ligament is similarly tied _ and the broad ligament divided proximal to the ligature. Thus the line of ligatures and division of the broad ligament structures is carried on downward until the cervix is reached.

If the appendages are to be sacrificed _ the earlier stage of the operation only differs from the preceding technic in that when the appendages are also to be excised, the broad ligament ligatures are to be placed to the outer sides of the ovaries and tubes (v. Fig. 6058, p. 645). And the subsequent ligatures of the broad ligament structures will pass in a downward and inward direction _ until, by the time they have reached the cervix, they will occupy the same position as will the division of the broad ligament, as just described in the preceding technic.

After the downward ligation and section of the broad ligaments has passed the round ligament, the anterior and posterior leaves of the broad ligaments will tend to fall apart or be more readily opened up _ and it is in the interval between these leaves, along the lateral aspect of the cervix, or just posterior to the lateral aspect, that one must be on the lookout for the uterine vessels in their course through their connective-tissue beds to the wall of the uterus These vessels are carefully and securely ligated _ which is most safely accomplished by first exposing them and then passing the ligatures carefully beneath

them with an aneurysm needle – working close to the uterus and superficially rather than dipping deeply out of sight, so as to avoid including or injuring the ureters. At times it may not be possible to expose the uterine vessels until the two lateral incisions which free the broad ligaments are connected by the transverse ones over the front and back of the cervix, especially the posterior section.

Various methods of dealing with the cervix and opening the vagina are employed.

(*a*) The cervix may be removed, along with the uterus, by what is termed a "coning" and sometimes a "coring" process – the object of which being to

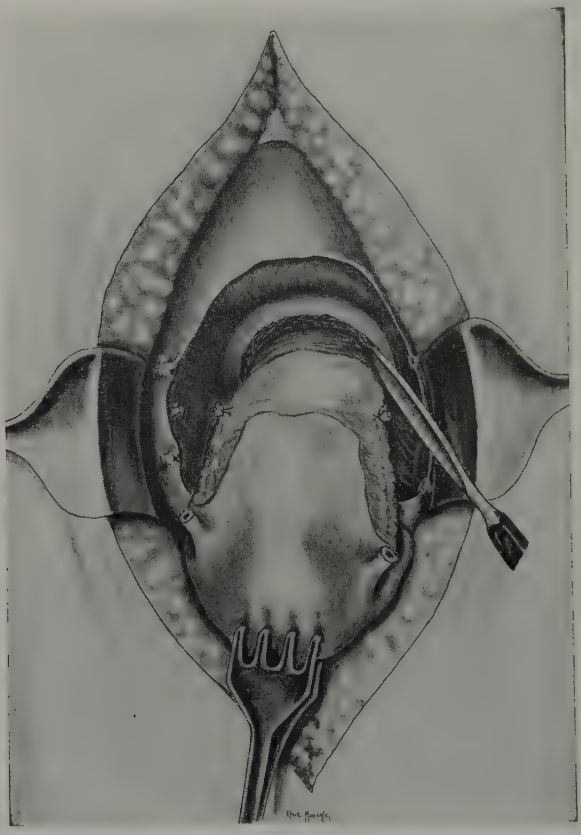


Fig. 6070.—Excising the Major Portion of the Cervix, Along with the Uterus, by the "Coning" or "Coring" Method.

leave an outer wall shell of cervix – and to minimize the danger of wounding the ureters and bladder. This is accomplished by making with knife or curved scissors – and while the uterus is being drawn upward – a circular incision through the cervical tissues, with inward obliquity, toward and into the vagina (as one cores an apple) – so calculating that all of the cervical canal and most of the cervical tissue will be removed, and yet a thin shell of cervical tissue will be left next to the sides of the vaginal vault (Fig. 6070). The same result is accomplished by making a series of light circular sweeps of the knife around the cervix while the uterus is being drawn upward.

(*b*) The most frequently employed method of freeing the cervix is by

circularly cutting through the dome of the vaginal wall where it is reflected around the vaginal portion of the cervix – closely hugging the contour of the cervix in making the section. This section is not made until the vesico-uterine peritoneal reflection has been divided over the cervico-uterine junction, and the peritoneal fold, including the bladder, drawn well forward of the line of intended section. Similarly, if there be any adhesions between the rectum and the posterior aspect of the cervico-uterine peritoneal reflection, in Douglas' culdesac, the peritoneum should be transversely incised posteriorly just above the vaginocervical junction, and the peritneum freed down to below the line of posterior incision into the vagina. If the position of the vagino-

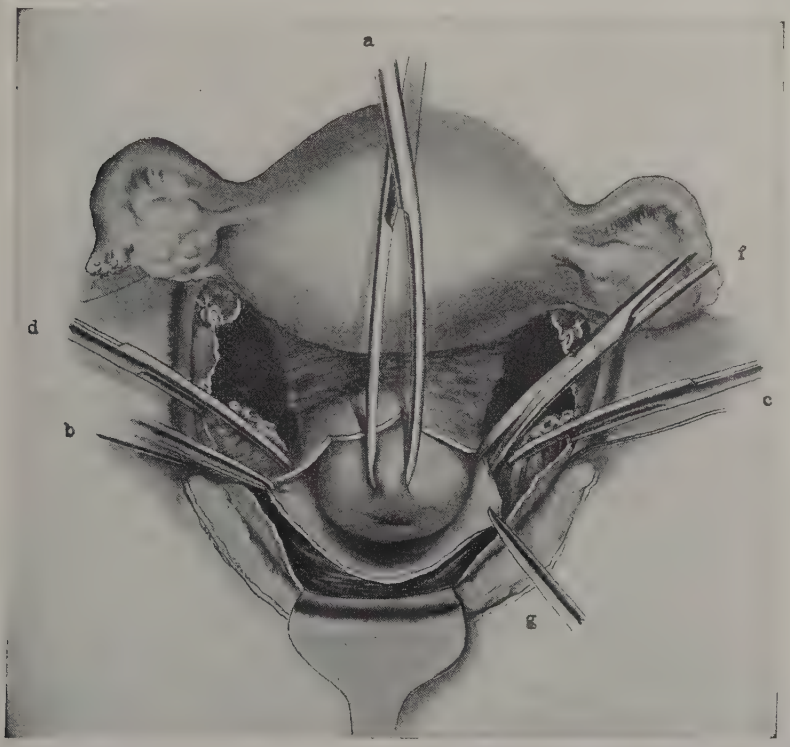


Fig. 6071.—Severing the Dome of the Vagina from the Neck of the Uterus from Within the Abdomen; – An anterior median incision has been made down the anterior aspect of the vagina – and the two lateral margins of this incision, b and g, retracted. Scissors, f, are transversely dividing the dome of the vagina close to its uterine attachment, beginning near the upper limit of the median incision. When the opening in the vagina is sufficiently large, vulsellum forceps, a, grasp the cervix and bring it forward into the abdominal wound; c and d, clamps of the broad ligaments.

cervical junction cannot be clearly defined from within the wound, then an Assistant should pass a sound into the vagina – and upon its bulging tip the anterior vaginal fornix is opened – and with one blade of a pair of curved scissors the rest of the section of the vaginal dome is made, closely hugging the rounded contour of the cervix.

(*c*) Crossen's method of removing the cervix along with the uterus – is planned to provide for the impossibility of knowing at exactly what level the vaginal wall is reflected upon the cervix. A limited anterior, median, vertical incision is made – beginning over the lower aspect of the uterus, and extending downward over and into the vagina. This section will, neces-

sarily, cross the cervicovaginal junction — and land in the vaginal cavity, thereby defining the exact cervicovaginal junction. The two margins of the vaginal opening are caugth by clamps and drawn apart, while curved scissors cut the vaginal dome from the cervix as closely as possible — and as far posteriorly as possible. The cervix is then grasped, through the vaginal incision, by vulsellum forceps and delivered through the vaginal incision — after which scissors divide the posterior connection of the vagina to the cervix. During the posterior portion of the section the structures posterior to the vaginocervical junction in the pelvic cavity are safeguarded by a finger held against the scissor blade which is outside of the vagina. As the circular section of the vaginal dome is made, the margins of its freed walls are lightly caught by clamps to hold them within reach in the field.

(*d*) The removal of the cervix may be separately carried out — after the supravaginal amputation of the body of the uterus (v. i. p. 665). Noble advises this method to those Surgeons who are accustomed to more frequently performing supravaginal hysterectomy. He mentions several different ways of accomplishing the separate removal of the cervix following the removal of the body of the uterus. (1) In one of these methods each half of the supravaginally and transversely divided cervix is steadied with vulsellum forceps, and the cervix, following the uterine canal as a guide, is then split down medially and anteroposteriorly into the vagina. The structures down each side of the split cervix are then ligated and the halves cut away. (2) In Doyen's method, after the supravaginal section of the cervix and its medial splitting, each half is grasped with stout vulsellum forceps and drawn upward into the pelvic wound — and while the halves are, in turn, thus drawn upon, the parametrial tissues are cut through, severing the halves from these and from the vagina — after which any vessels which bleed are seized and tied — and are further controlled in closing the vaginal opening.

In all cases in which the uterus is severed from the cervix supravaginally, before undertaking to remove the isolated cervix separately, the uterine vessels are, of necessity, already tied before the removal of the cervix is begun. But in those cases in which the cervix is removed along with and as part of the single structure — which is the case in the majority of cases, then the ligation of the uterine vessels prior to undertaking the removal of the cervix is, of course, imperative. If the ligation of these have not been accomplished in the manner mentioned in ligating and dividing the structures of the broad ligaments, then special steps for the exposure and double tying of the uterine vessels are necessary when the cervix is approached — which, in unusual cases, especially those complicated by adhesions, may present some difficulties. Sometimes the uterine vessels are first clamped in these cases — very closely to the cervix — and then tied after the removal of the cervix and the clamps. But it is much better to deliberately expose them by dissection and ligate them in their beds, without blocking the parts by clamps and endangering the ureters by the same instruments.

As soon as the vagina has been opened up by the removal of the cervix, it is well to brush over the cut vaginal margins and the upper part of the vagina with one-quarter or one-third strength of the tincture of iodin. Any vessels in the cut margins of the vagina which bleed are tied with fine chromic catgut.

All involved tissue having been now removed, the closure of the vaginal vault, the covering of the stumps of the appendages, if removed, and the union of the separated leaves of the broad ligaments are next in order.

The question of closing the vaginal vault or temporarily using the opening as a drain of the field of operation, will depend upon the nature of the case.

When temporary drainage is to be employed, a "cigarette" drain, of combined gauze and rubber tissue, is usually employed – or a rubber tube – which is drawn through the vaginal opening until flush with its upper limit and anchored to the vaginal wall by a catgut stitch.

The method of closing the vaginal vault – which is always preferable unless contraindicated in the special case – may be accomplished by one of several methods.

When one of the usual simple methods of circular division of the vaginal vault is made, the closure may be accomplished in one of several ways: – Interrupted sutures may be carried anteroposteriorly through the free edges

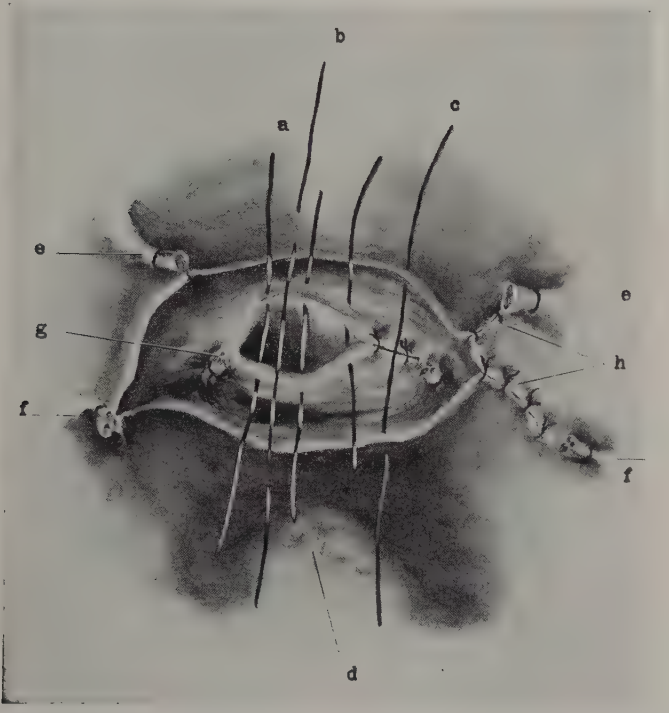


Fig. 6072.—Closure of the Opened Vaginal Vault After Total Hysterectomy; – In the method here followed: – a, Sutures uniting the margins of the vaginal wall; – c, union of the edges of the peritoneum over the buried tier of vaginal sutures; – b, or the vaginal tier of sutures may be buried by a Lembert type of suture of the peritoneum; – f, f, ligated ovarian vessels; – e, e, ligated round ligaments; – g, ligated left uterine vessels; – h, margins of the peritoneum sutured over the pelvic wound.

of the vaginal wall proper (Fig. 6072, a) – thus first approximating the raw edges of the vagina to each other, after which the cut edges of the peritoneum may be brought together by marginal stitches over the already sutured edges of the vaginal walls (v. Fig. 6072, c). Or, following the first row of sutures approximating the vaginal margins in the manner just described, the peritoneal borders may be brought together over the vaginal stitches by means of the Lembert type of stitch (v. Fig. 6072, b). Or the margins of the vaginal mucosa and the margins of the cut peritoneum may be first sutured together (Fig. 6073, b) – after which flat surfaces of distinct width of peritoneum, bodering upon the anterior vaginoperitoneal suturing, may be sutured to a corresponding width of peritoneum bordering upon the posterior vaginoperi-

toneal suturing (v. Fig. 6073, c) _ where it is seen that this modified form of Lembert stitch included a very narrow margin of vaginal mucosa, and a very wide margin of peritoneum _ the final union taking place between the peritoneal surfaces).

When the major portion of the cervix has been removed, along with the body of the uterus, by the "coning" or "coring" process, the method of closing the vaginal dome is somewhat different. The method practised by Giles appears to be excellent. The shelving borders of the cored-out cervix, includ-

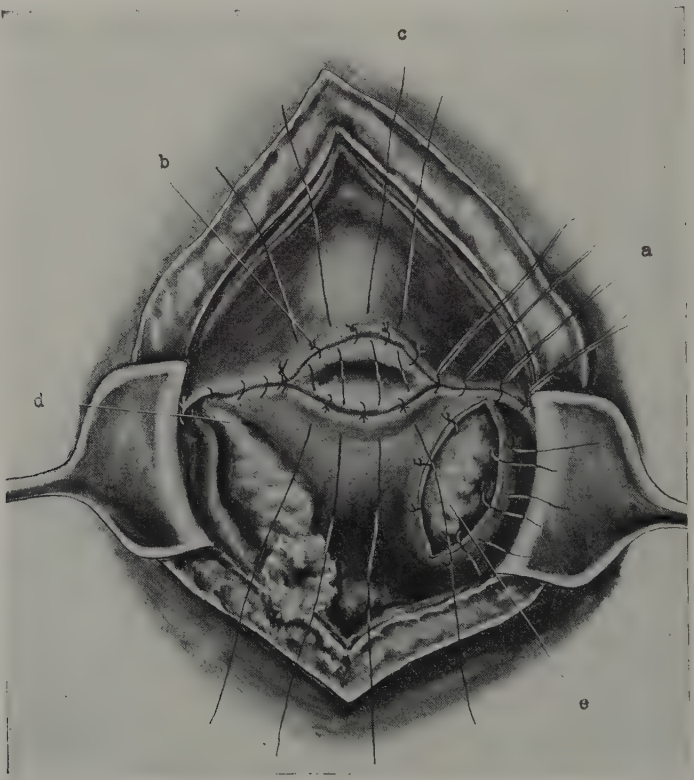


Fig. 6073.—Closure of the Opened Vaginal Vault After Total Hysterectomy; _ In the method here followed: _ b, Interrupted sutures uniting the free edges of the vaginal mucosa and the peritoneal serosa; _ c, sutures approximating the surfaces of the vesico-uterine and recto-uterine peritoneum, as well as taking hold of the extreme margins of the vaginal mucosa; _ a, approximated borders of the divided peritoneum; _ d, ligated stump of the retained (non-separated) left ovary and tube buried in the broad ligament suturing; _ e, temporarily removed ovary grafted upon the pelvic floor through a slit in the peritoneum.

ing the adjacent peritoneum, at some little distance from these borders, are first brought together by two mattress-sutures of stout silk _ so placed that one limb of each mattress-stitch passes on the outer side of the ligated uterine vessels, and the opposite limb of the same stitch, through the outer third of the opposite cupped surfaces of the cervix. These two mattress-stitches, having the effect of four single stitches, accomplish the first substantial approximation of the obliquely cut cervical walls as well as reinforcing the ligated uterine vessels (Fig. 6074). The second row of suturing consists of a continuous stitch of fine silk _ approximating the opposite margins of the

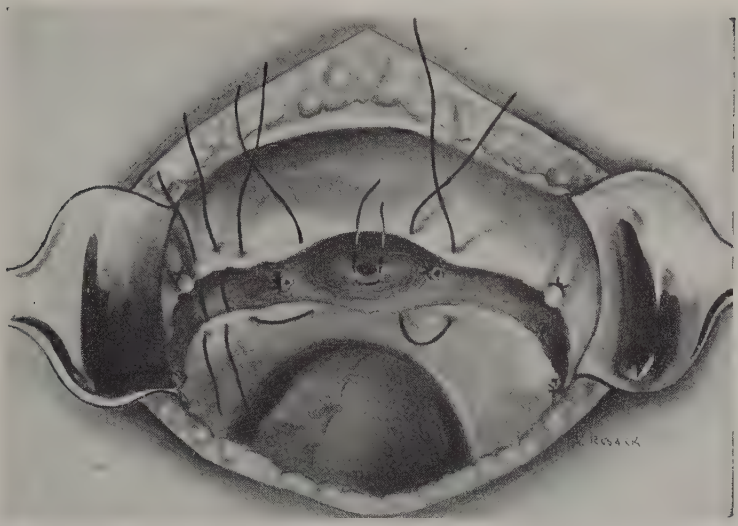


Fig. 6074.—Closing the Cervical Opening and the Pelvic Floor Partly or Entirely by Mattress-sutures in the Supravaginal Removal of the Uterus; – The additional support of the ligated uterine vessels by the mattress-stitch is especially seen.

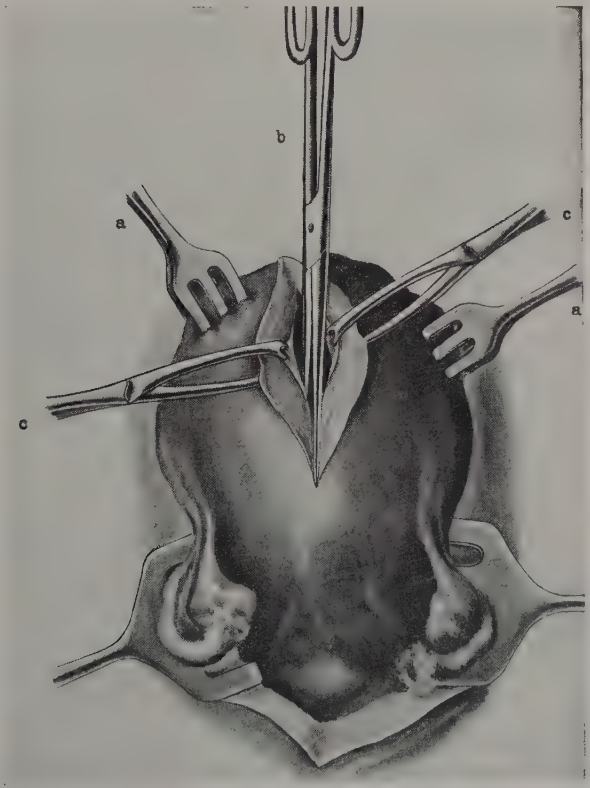


Fig. 6075.—Total Abdominal Hysterectomy of the Uterus Bisected from Fundus Through Cervix, With or Without the Appendages – I: – a, a, Vulsellum forceps supporting the uterus; – b, scissors incising the anterior wall of the uterus downward from the fundus; – c, c, vulsella retracting the lips of the uterine wound.

cut peritoneum, from the beginning of the separation of the broad ligament leaves, at the free borders of the broad ligaments, down to the cervix _ and then passing through not only the margins of the peritoneum, but the shelving margins of the outlying portion of the cervix left after the coring out of its center.

In the technic last described the entire pelvic wound is closed. In the methods of closing the cervical opening previously described the anterior and posterior leaves of the broad ligament have to be brought together separately on each side of the sutured cervical wound.

The abdominal wound is closed in the usual manner.

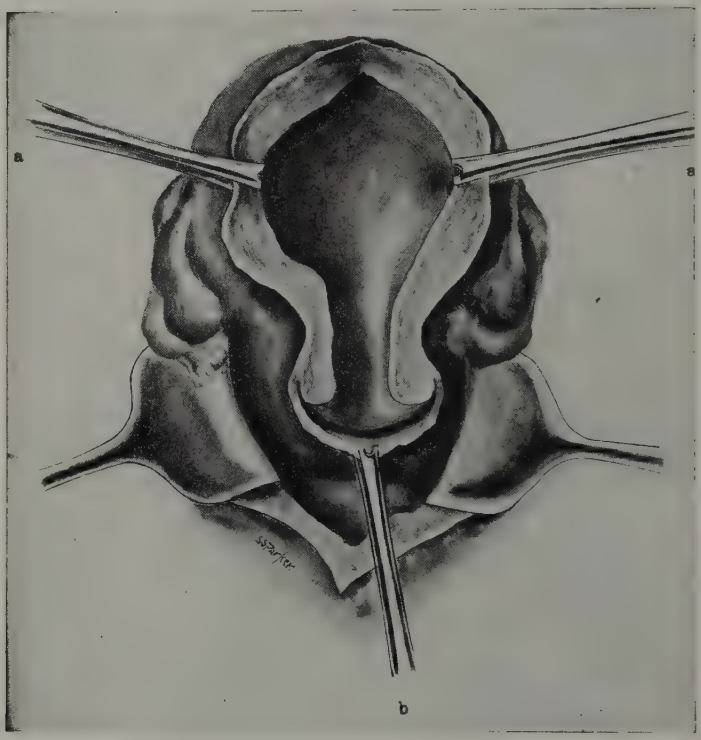


Fig. 6076.—The Same _ II: _ a, a, Tractors holding apart the two margins of the uterus split medially down its anterior wall into the vagina; _ b, tractor in the lip of the vaginoperitoneal wound opening into the anterior vaginal fornix.

(*B*) **Total Abdominal Hysterectomy, of the Bisected Uterus, With or Without the Appendages.**—In this technic the uterus is medially split from the fundus downward _ the incision, below, passing into and through the cervix, through the incised vagina _ after which each half of the bisected uterus is systematically excised. The method is especially resorted to in cases where some difficulty or complication makes the method of removal by bisection seem preferable to removal of the intact organ. Many of the features of procedure in removing the entire uterus by bisection are the same as already described in the supravaginal removal of the uterus by bisection with or without the simultaneous removal of the appendages. The uterus is delivered as prominently into the wound as possible and steadied by vulsella. A medial opening is made into the fundus of the uterus by knife

_ and through this the blade of a pair of stout scissors is introduced (Fig. 6075) and, guided by the narrow but blunt point of the blade within the cavity, divides the anterior wall of the uterus, through the body of the uterus, cervix, and into the vault of the vagina, through the anterior fornix. The two halves of the uterus are then seized with Museaux forceps and drawn apart (Fig. 6076) _ and, while thus held, the posterior median wall is divided. A finger should be carried posterior to the uterus as a safeguard during the procedure _ or, if this be impossible, the division of the posterior wall must be made from the front from within the uterus, cutting carefully, so as to recognize its posterior limit. Or, sometimes, further enucleation of the partially bisected uterus must be undertaken from the sides without completing the bisection. If the bisection have been completed as planned, the two halves of the uterus

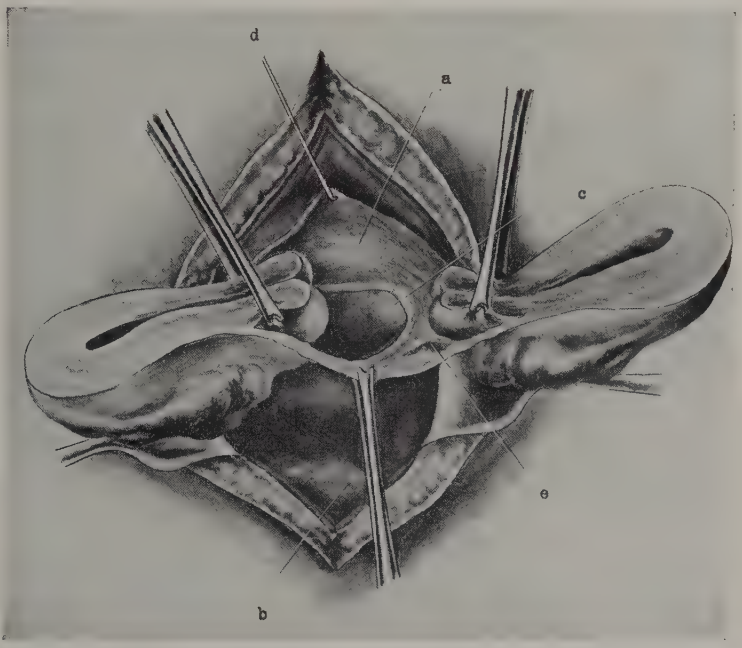


Fig. 6077.—The Same _ III; _ The uterus has been completely split into two halves, anteriorly and posteriorly. Each half, held by a vulsellum, is still attached to and held by the parametrium of its own side: _ a, Bladder; _ b, rectum; _ c, cavity of vagina; _ d, vesical peritoneum retracted; _ e, right uterine artery.

can then be clamped at their cervix and drawn apart (Fig. 6077). As the section has been made in the median line not as much bleeding occurs as might be expected from so extensive a cut. The uterine vessels of both sides are then brought at once into the field by a little additional dissection, if necessary, and doubly ligated and divided. When these have been controlled, the parametrial tissues of each side are clamped and divided (Fig. 6078). The final closure of both the vaginal opening and the separated leaves of the broad ligaments are then accomplished in exactly the same manner as already described for the uncomplicated operation of total hysterectomy of the intact organ.

(*C*) **Total Abdominal Hysterectomy Accomplished by First Excising the Uterus Supravaginally and then Excising the Separated Cervix.**—The Kelly method of freeing the uterus (in intraligamentary fibroids supra-

vaginally – "from left to right" or "from right to left" – v. Fig. 6037, p. 634) may be first carried out. The left ovarian vessels and ligament are first tied and divided – the round ligament is next tied and cut – after which the separating leaves of the broad ligament will lead to the left uterine vessels, which are carefully exposed, doubly ligated, and tied (v. p. 641). The cervix is then cut through transversely, supravaginally – the section being made very carefully as the right aspect of the cervix is approached, as soon as the last fibers of which are cut through, the right uterine vessels are due to come into the field, especially if the now separated body of the uterus be turned over somewhat to the right. If the vessels are not thus sufficiently exposed a limited amount of dissection in this site will usually bring them

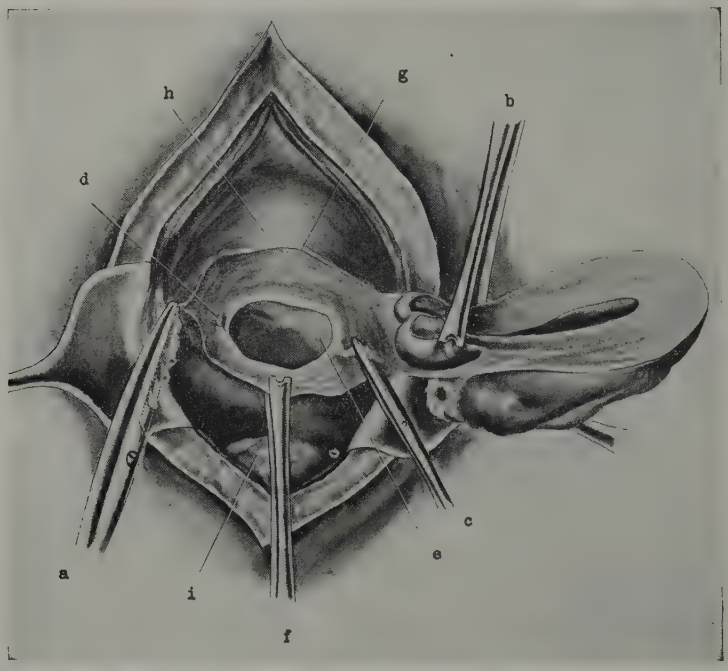


Fig. 6078.—The Same – IV: – **a**, Clamp controlling left broad ligament following excision of left half of split uterus and adnexa; – **b**, clamp grasping right half of split uterus preparatorily to clamping and severing right broad ligament. The right uterine artery is clamped, **c** – and the left is ligated, **d**. The vaginal vault is widely open, **f**. The margins of the cut vaginal mucosa, **e**, and of the severed peritoneal serosa, **g**, in the floor of the pelvis are seen – as well as the bladder, **h**, in front – and the rectum, **i**, behind.

into the field. They are at once doubly ligated and divided – and the parametrial structures of the right side then ligated and divided, as they were upon the left. The cervical tissues are then grased with a medium toothed clamp, and, while steadied and drawn outward, are dissected from the paracervical tissues and vaginal vault with sharp curved scissors in the manner already described (v. p. 642).

(*D*) **Doyen's Abdominal Panhysterectomy.**—The salient feature planned to be accomplished by this technic is the more easy freeing of the uterus from the bladder. While sometimes carried out as a general procedure, its especial field of application is in the presence of uterine fibroids. The uterus is drawn upward in the wound and displaced forward over the pubes. A transverse incision is made in Douglas' culdesac, through the recto-uterine peritoneal

reflection, into the posterior vaginal fornix. Through this posterior opening a pair of clamp forceps are made to grasp the cervix and, turning it backward, deliver it through the opening in the recto-uterine pouch. The lateral and anterior connections of the cervix are then divided _ while hugging the uterine musculature closely. Continuing to practice traction upon the inverted uterus, and to cling closely to its contour in the process of dissection, blunt and sharp, the organ is finally enucleated _ ligating and dividing the broad ligaments closely to the uterus. When this is accomplished the adnexa are dealt with as indicated.

ABDOMINAL HYSTEROMYOMECTOMY

Description.—The removal of a myofibromatously involved uterus by the abdominal route. The method of removing the myomatous uterus differs in no material respect from the several methods already described of removing the uterus in general _ in so far as the technic, at large, is concerned. Whatever minor modifications of the usual procedures may be adopted will depend largely upon the special conditions which may complicate the particular case _ of which adhesions are apt to form the most important part. It is also to be added that size alone may so interfere with the exposure and control of certain parts, in the progress of the more typical operations, that modified steps must be taken to circumvent the ends as well as possible.

Hysteromyomectomy may be supravaginal or total _ the former being more ideal when not contra-indicated by involvement of the cervical region.

The myomatous uterus may be removed intact when the complete operation or panhysteromyomectomy is indicated _ or after bisection _ or the body of the uterus may be first removed supravaginally, and then the cervix be excised.

The myomatously involved uterus may be removed with or without its appendages _ as indicated by the condition of those parts or by the nature of the case _ preservation of the ovaries or an ovary being especially desirable if possible.

The general methods of removing the uterus in part (supravaginally) or in whole have been given in such detail that these details will not be again gone into in connection with the removal of the uterus involved by myomata. Only some special features connected with the methods most in use will be here covered.

Preparation _ Position _ Landmarks _ Incision.—As for the removal of the uterus by the abdominal route, in general.

(*a*) **Abdominal Supravaginal Hysteromyomectomy by the Division, *Parri Passu*, of the Broad Ligaments Down Each Side, Followed by the Transverse Division of the Corporocervical Junction _ With or Without the Excision of the Appendages.**—The technic here is the same as that described for the supravaginal removal of the uterus uninvolved by fibroids (v. p. 639) _ with the difference that the procedure is apt to be complicated by one of the chief accompaniments of fibroids _ adhesions. If the growths themselves are of moderate size, the removal may usually be accomplished with but little if any departure from the ordinary technic described as cited. Where applicable, this may be considered among the best methods of removing myomatous uteri.

It is rather the elements of complication _ especially as to adhesions, size, and position of the uterine tumors, together with pathologic conditions of the adnexa _ which present the chief difficulties, than the routine technic. Dense adhesions are sometimes more easily broken up by following down the

fallopian tubes and working up under the tubes and ovaries, than from above downward.

Free more closely to the organ to be removed than to the structure to be retained. A sound in the uterus will often aid in outlining the cleavage line of dense adhesions along which separation must be accomplished by knife and forceps or scissors rather than blunt dissection. Confused masses which seem impossible of separatoin will often yield to alternate freeing of these parts by blunt dissection in one field, and by sharp dissection in an adjacent one – returning to the original field when some progress has been made in the secondary field.

In very much complicated cases the passage of metallic ureteral catheters may be of considerable service in defining the position of these important structures.

Also, in such cases, the uterine arteries may be ligated further back in the pelvis, nearer their origin from the anterior branches of the internal iliacs – first assuring one's self of the position of the ureters by picking up the uterine artery and parallel tissues between the index and thumb – and then allowing it to slip out of the grasp. If this be done, the artery can be caught and drawn up and the dissection of the connective tissue be carried on down to the uterus.

Veins, large single ones and in plexuses, are apt to be encountered in the broad ligaments and in the pelvic floor. Besides all the vessels usually encountered in ordinary hysterectomy, many new and large ones may be encountered in hysteromyomectomy.

In manipulating some of the large masses made up of tumor and uterus definitely firm hold of the parts is necesary. Sharp-pronged instruments should only grasp tumor masses, and not be applied where their points may enter the uterine cavity, which is often infected, and out of which fluid is apt to be squeezed in the manipulations. It is rather well to grasp the broad ligaments at the uterine cornua with stout clamp forceps and use these for handles in manipulating the parts.

While it may be a matter of preference to follow down the anterior surface of the broad ligaments in making the ligations and divisions, it may be a matter of necessity to work down the posterior aspect – owing to adhesions or tumor masses which may determine this point.

Matters will be additionally complicated if pus collections be present – especially if broken into – or if infection be undetectedly spread from suspicious surfaces. If pus be encountered the pelvis is at once lowered – and additional packing off of the rest of the cavity carried out.

Sometimes the beginning of the freeing of the combined uterus and tumor mass cannot be made from either in front or from behind – but only down one or the other side, while the mass is displaced to the opposite side.

The safe separation of the bladder from the neck of the uterus is particularly important – which is accomplished, after dividing the upper parts of the broad ligaments, by pushing forward and upward the vesico-uterine peritoneal reflection, after its transverse division over the corporocervical junction of the uterus.

The general features of supravaginal hystero-oöphoro-salpingectomy, approached from behind, is seen in Fig. 6079 – in which the classical *pari passu* ligating or clamping and division of the broad ligaments from above downward, outside of the appendages, are seen. The left broad ligament has been tied and divided. The right one is being divided between clamps. The posterior half of the supravaginal cervix has been divided down to the cervical canal. Figure 6080 represents a somewhat different technic, in that clamps

alone are used up to the stage shown – but it illustrates, as well, a later stage of the preceding picture – the rest of the cervix being divided and the vesico-uterine peritoneal pouch being approached.

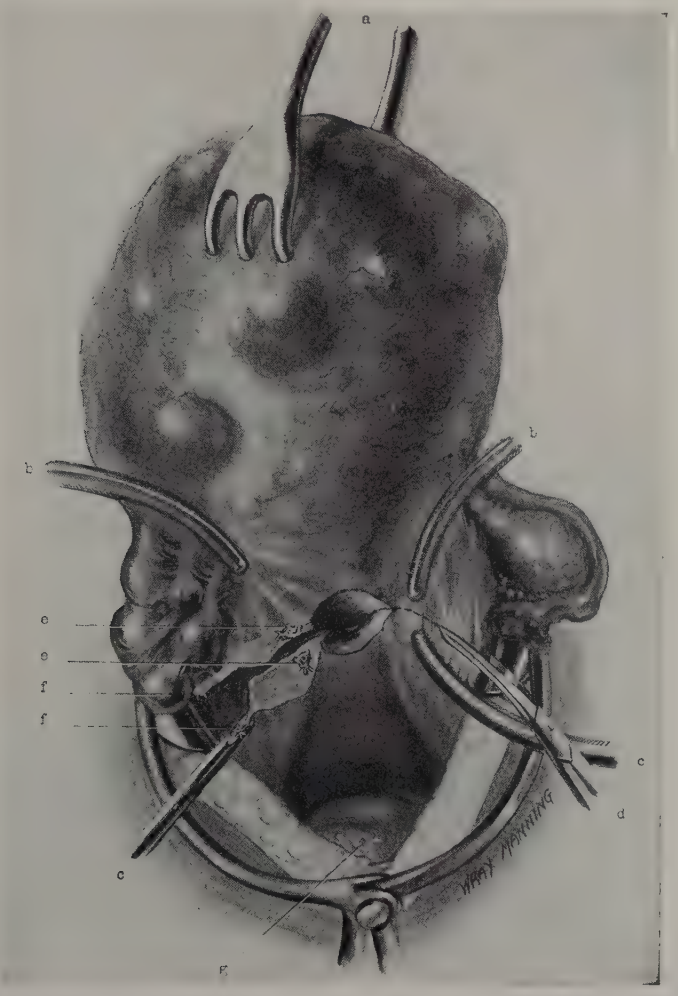


Fig. 6079.—Abdominal Supravaginal Hysteromyomectomy, Including the Excision of the Appendages – by the *Pari Passu* Division of the Broad Ligaments Down Each Side, Followed by the Transverse Division of the Supravaginal Cervix; – The myomatous uterus adherent in front has been lifted as far out of the cavity as possible and held forward – exposing its posterior aspect and Douglas' culdesac: **a**, Heavy vulsellum supporting the weight of the mass; – **b, b**, clamp forceps grasping the broad ligaments at the uterine cornua and adjacent parts of the adnexa; – **c, c**, clamps holding the lower parts of the broad ligaments; – **d**, scissors dividing right broad ligament between clamps. The left broad ligament has been divided, and the ovarian vessels, **f, f**, and the uterine vessels, **e, e**, have been doubly ligated and divided. The posterior aspect of the supravaginal cervix has been divided into the cervical canal; – **g**, rectum, passing forward between uterosacral ligaments.

Finally, following the removal of the combined mass, the cervical stump is sutured in the usual manner – with or without provision for temporary drainage, as may be indicated – and the margins of the peritoneum brought together over the entire pelvic wound.

(*b*) **Total Abdominal Hysteromyomectomy of the Intact Uterus, With or Without the Appendages, by the Downward Division of the Broad Ligaments.**—This method, as applicable in general, independently of the myomatous nature of the case, has been described and pictured (v. pp. 656-667). The application of the technic to cases where the removal of the uterus is complicated by myofibromata may be gotten from the general description, as above quoted _ and from the description immediately

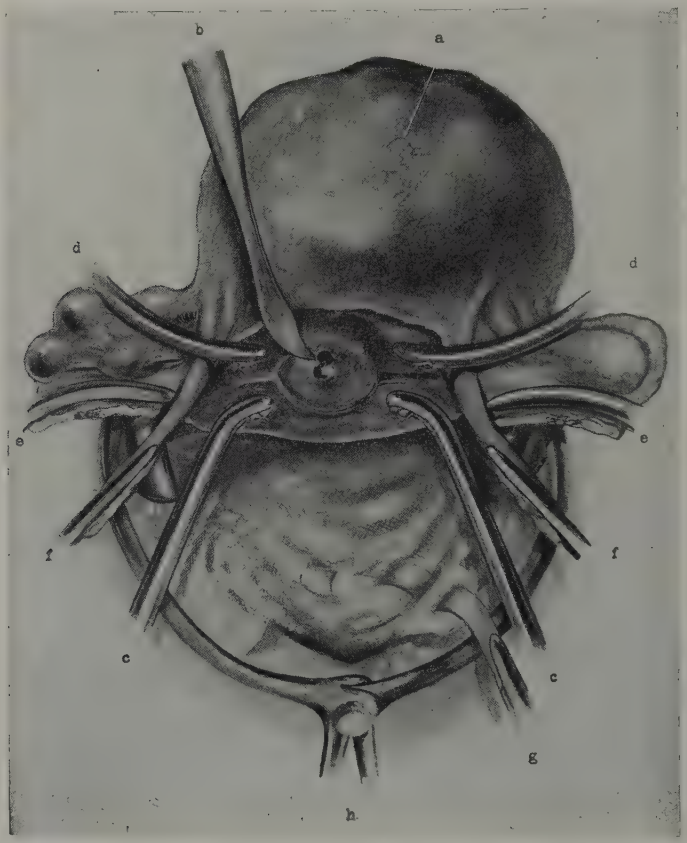


Fig. 6080.—Abdominal Supravaginal Hysteromyomectomy, Including the Appendages, by the Downward Division of the Broad Ligaments; _ The steps covered in the preceding illustration have been carried out _ though this picture is not in direct group sequence: **a,** Uterus, nearly completely divided supravaginally, is tilted forward; _ **b,** Segond's knife, obliquely dividing the cervix, so as to leave the upper surface of the retained portion cupped; _ **c, c,** clamps upon proximal ends of divided uterine vessels; _ **d, d,** clamps upon distal ends of same; _ **e, e,** clamps of the broad ligaments and ovarian vessels; _ **g,** tape of gauze pack; _ **h,** automatic abdominal retractor.

preceding, of supravaginal hysteromyomectomy, also performed by the downward division of the broad ligaments.

The complete removal of the uterus involved by myomata is rarely called for _ unless the tumors also involve the cervical portion of the organ.

(*c*) **Abdominal Supravaginal Hysteromyomectomy by the Division of the Broad Ligament Downward, Transverse Section of the Uterus at the Internal Os, and the Division of the Opposite Broad Ligament Upward, With or Without the Excision of the Appendages** _ Péan-Kelly

Technic.—The continuous side-to-side method of dividing the parts, worked out by Péan, and elaborated by Kelly, may be applied to hysterectomy in general, but is especially appropriate for fibroids, and particularly the intra-ligamentous type. The structures are divided in one continuous sweep, down one broad ligament, across the internal os, and up the opposite broad ligament – beginning upon whichever side is more convenient (usually upon the side where fewest complications present themselves).

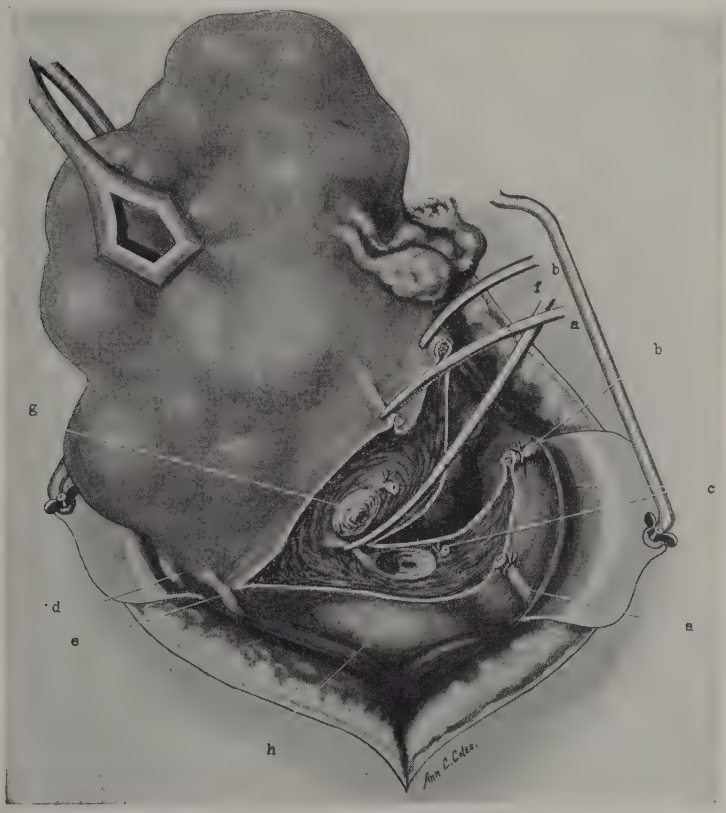


Fig. 6081.—Abdominal Supravaginal Hysteromyomectomy – by the Division of One Broad Ligament, Transverse Section of the Uterus at the Internal os, and the Division of the Opposite Broad Ligament Upward – Péan-Kelly Technic – I: – **a, a,** Left round ligament clamped proximally and ligated distally; – **b, b,** left ovarian vessels clamped distally and ligated proximally; – **c, c,** left uterine artery doubly ligated and divided; – **d,** right fallopian tube; – **e,** right round ligament; – **f,** clamping right uterine artery; – **g,** uterine end of divided cervix; – **h,** bladder.

Begin by ligating the ovarian vessels and ligament and round ligament of one side – after which the broad ligament is divided as far as the cervix (Fig. 6081). The cervix is approached carefully – not to prematurely cut the uterine vessels. The vesico-uterine peritoneal reflection is transversely incised and pushed from the uterus by a gauze-covered finger – and the bladder pressed forward. When this has been accomplished and the lateral incision carried near to the cervix, the uterine vessels of that side are exposed, and are ligated low down, near the cervix, by means of an aneurysm needle. The cervix is now transversely divided just above the vaginal junction with stout curved scissors. This section proceeds with especial care as the opposite lateral limit

of the cervix is reached. The almost severed cervix is held by forceps at this stage – and the uterus is tilted away from the side first divided. The parts must be kept sponged, so that progress can be watched – and as the last fibers of the cervix are severed the uterine vessels of the second side come into view as the leaves of the broad ligament open up – are further freed – and then doubly ligated.

As the Assistant continues to draw the uterus to the second side, the broad ligament structures of that side are ligated and divided in the reverse order – round ligament, ovarian ligament and vessels, and tube – until the whole mass is freed and removed.

The sides of the cervix which have been cupped in the transverse section are brought together by sutures in one of the manners already described – and

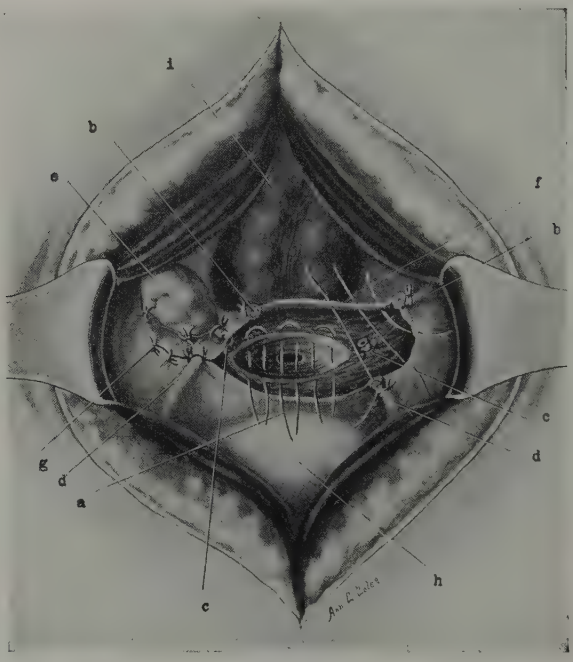


Fig. 6082.—Closure of Cervical Stump and Pelvic Floor Following Supravaginal Hysteromyomectomy: – a, Mattress-sutures closing cervical stump; – b, b, ligated ovarian vessels; – c, c, ligated uterine vessels; – d, d, ligated round ligaments, the right one being buried; – e, grafted ovary in the slit peritoneum; – f, sutures approximating peritoneal margins; – g, sutured right end of peritoneal wound; – h, bladder; – i, rectum.

the margins of the peritoneum are sutured together, covering the cervix as well as the raw pelvic bed (Fig. 6082).

(*d*) **Abdominal Supravaginal Hysteromyomectomy by Bisection.**—The general method of accomplishing bisection of the supravaginal portion of the uterus has been already described and pictured (v. pp. 649–656). Total bisection is rarely performed in these cases because it is seldom necessary to sacrifice the neck of the uterus – but when this is also involved by the growths, or otherwise badly diseased, the procedure is wisely converted into a complete bisection – which, if not planned from the first, may be accomplished after the removal of the supravaginally bisected body of the uterus by the separate excision of the cervix.

In performing supravaginal hysteromyomectomy by bisection each cornu of the uterine fundus is seized by stout Museaux forceps, and while these draw upward and tend to pull outward from the middle line, the fundus and body of the uterus are divided exactly in the median line, down to the isthmus, on a level with the uterovesical peritoneal reflection, or culdesac. When the lower end of the incision is reached the bladder is safely freed from the field of operation by blunt dissection and displaced forward. If it be necessary in order to satisfactorily accomplish this a transverse incision, carried only superficially, may be added to the vertical incision, traversing the vesico-

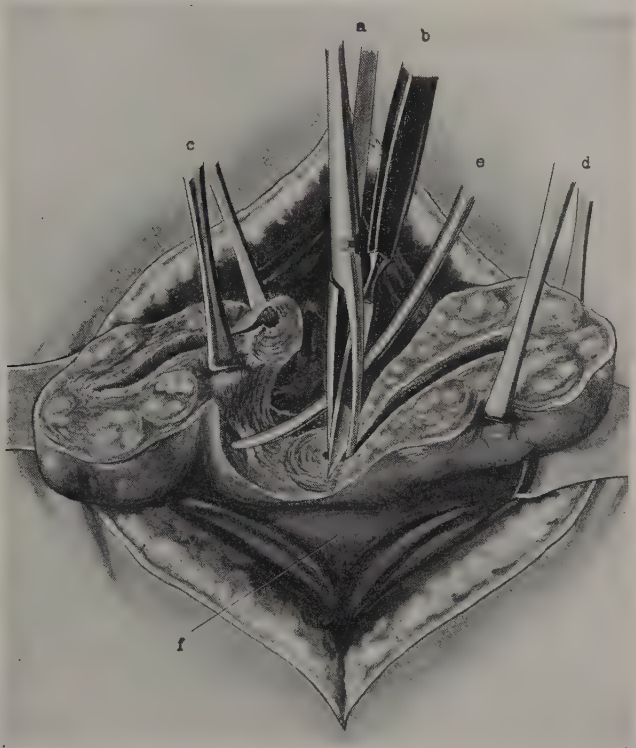


Fig. 6083.—Abdominal Supravaginal Hysteromyomectomy by Bisection from Fundus to Isthmus, Followed by Transverse Section; – Having incised the fundus medially, the long forceps, a, is introduced down the uterine canal into the vagina – and between the separated blades, the knife, b, bisects the uterus down to the cervix, thus necessarily keeping the median relatively non-vascular line. The two walls of each half are grasped and compressed by clamps, c and d – which are shifted to the cervix as the separation progresses. e, Clamp of the uterine vessels applied as soon as the half of that side is rotated outward; – f, bladder. (Modified from Kelly and Cullen.)

uterine reflection of peritoneum. The holds of the forceps at the cornua are then shifted so as to embrace both walls – of the divided uterus near the cervix – and then, while drawing upon and everting each half, in turn, the body of the uterus is severed from the cervix at the isthmus by means of stout, curved scissors – cutting carefully as the lateral fibers of the cervix are severed – at once recognizing the uterine vessels – and doubly tying and dividing them (Fig. 6083). Continuing traction upon the neck of the partially separated side, this half of the uterus is made to revolve outward, pivoting around the parametria and adnexa of its own side – which are now ligated and divided

from below upward, to the free border of the broad ligament of that side. The same procedure is carried out with the opposite side. Sometimes the lateral structures have to be first clamped and divided, and the halves of the uterus removed, before room can be gotten for ligating them.

Finally, the cervical stump is closed and the margins of the cut peritoneum united, in accordance with the general methods of procedure in these details – a method of accomplishing which is shown in Fig. 6084.

(*e*) **Abdominal Supravaginal Hysteromyomectomy, With or Without the Removal of the Appendages, by Transverse Division of Cervix and Separation of Uterus from Below Upward.**—This represents the uterine separation technic of Faure. The beginning of the separation of the

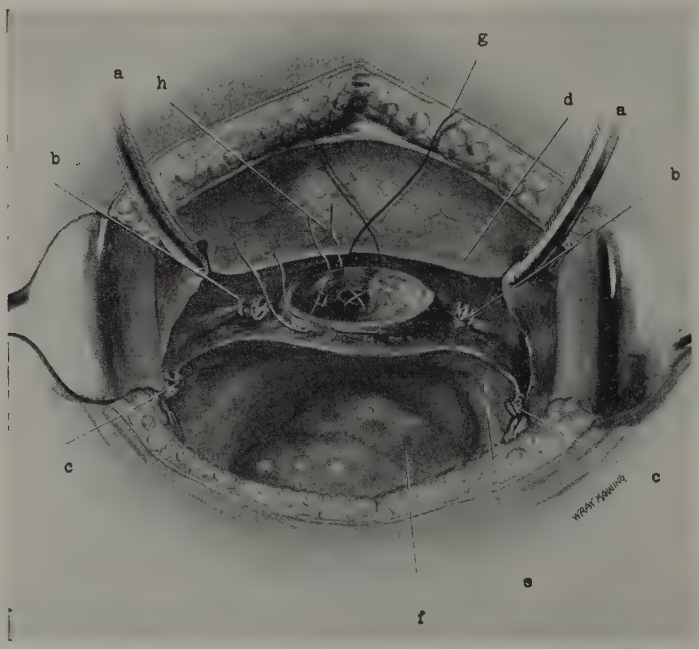


Fig. 6084.—Closure of Cervical Stump and Pelvic Floor Following Supravaginal Hysteromyomectomy: – a, a, Clamps upon the round ligaments; – b, b, ligated uterine vessels; – c, c, ligated ovarian vessels; – d, uterovesical peritoneum; – e, uterorectal peritoneum; – f, rectum; – g, crossed mattress-suture closing cervical canal and lower level of cupped-out cervix; – h, upper tier of sutures closing margins of cervical stump. The sutures uniting the edges of the peritoneum over the pelvic wound are not shown.

myomatous uterus is made through the portio supravaginalis, below the isthmus, and extends, thence, outward and upward on each side. The uterus is delivered as far out of the abdominal wound as possible and is displaced forward over the pubis. The first rallying point is the location of the uterine isthmus – which, after exposing Douglas' culdesac, is to be recognized by the constriction just below the body of the uterus, where it merges into the neck, and which corresponds with the position of the uterosacral ligaments, where the organ begins to slightly bulge out again into the smooth cervix. Fibromatous involvement of the parts may make the recognition of the isthmus less easy. The finger, introduced into the uterorectal pouch, down to the floor of the culdesac, between the uterosacral ligaments, with its pulp forward, will recognize the more yielding and less resistant vaginal wall, lying anteriorly

– and as the finger passes upward the projecting cervix will be felt – and passing still further upward, the isthmus. The portio supravaginalis of the uterus is then grasped, through the overlying tissues, by means of two stout curved clamp forceps – and while the parts are steadied and slightly drawn apart the section is made (Fig. 6085). As the division is carried forward, one proceeds cautiously, so as to recognize the uterine limits as soon as reached, and safe-

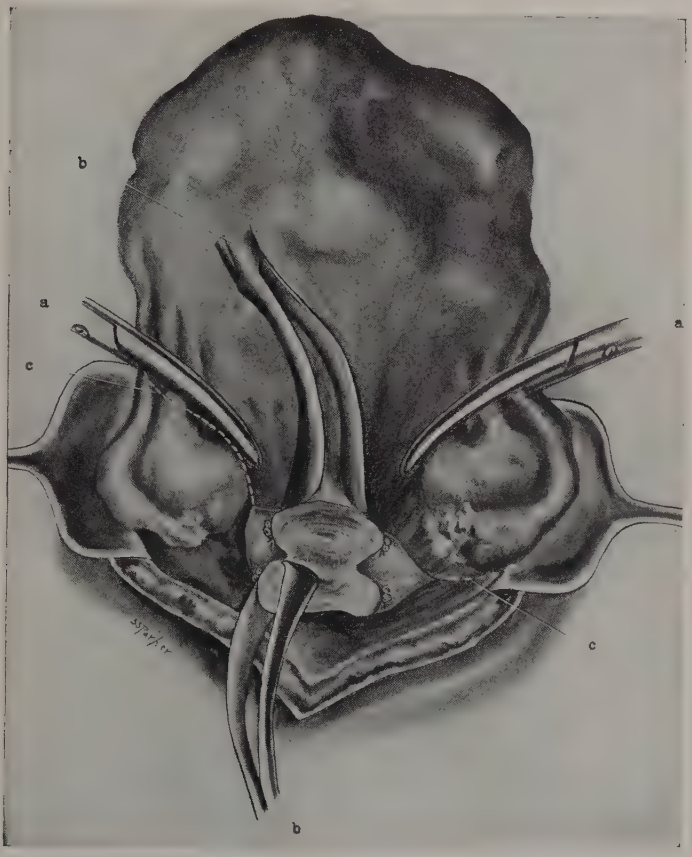


Fig. 6085.—Abdominal Supravaginal Hysteromyomectomy, With the Conservation or Sacrifice of the Appendages, by Transverse Division of the Portio Supravaginalis and Separation of the Uterus from Below Upward; – The left appendages are being here preserved, and the right excised. The parts are seen from behind. The uterus is drawn forward, Douglas' culdesac exposed, and the supravaginal cervix is being transversely divided while grasped by two stout clamp forceps, **b, b.** The uterine vessels are seen doubly ligated and divided immediately to the lateral aspects of the nearly severed cervix in the separated parametrial tissues. **a, a,** Clamps of broad ligament tissues between uterus and adnexa (the instrument upon the right should be rubber guarded and used lightly); **c, c,** lines of broad ligament division – leaving the right adnexa and removing the left ones.

guard the bladder in front – section in this plane being due to emerge anteriorly in the vesico-uterine peritoneal pouch. Immediately upon completing the lateral limits of the sections the uterine vessels are exposed, doubly ligated, and divided. Clamping of the broad ligaments is usually not indicated – although shown in the illustration. As soon as the body of the uterus is separated from the cervix the body is drawn upward, and the Surgeon introduces from behind two fingers into the interval between the upper and lower portions

of parametrial tissues thus opened up, first upon one side and then upon the other – into the space in front of the broad ligaments, with the palmar aspect backward and upward – and with these fingers lying in front of the broad ligaments the vesico-uterine pouch is protruded forward, and the tissues of the broad ligaments are picked up, in turn, between thumb and

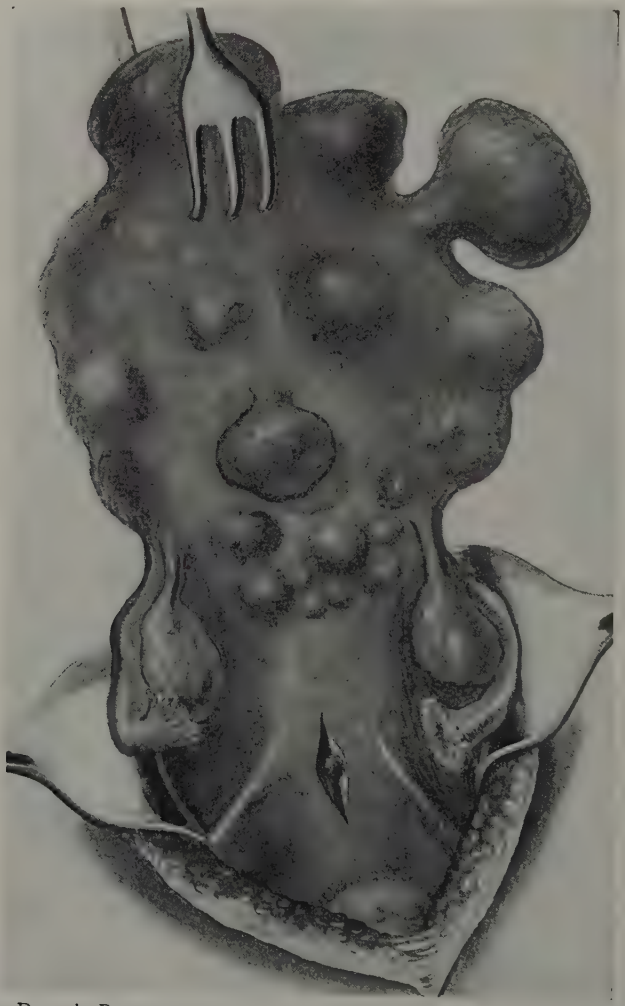


Fig. 6086.—Doyen's Panhysteromyomectomy – After Delivering the Cervix Through the Incised Posterior Vaginal Fornix and Separating the Organ from Below, Upward – I; – Opening the posterior peritoneal pouch, upon a vaginal sound introduced into the posterior vaginal fornix. (Figs. 6086–6089 modified from Döderlein.)

fingers – and ligated, tied, and divided. Clamps may be first used, and then removed after the broad ligament structures have been divided and are being ligated.

It will sometimes happen in carrying out this technic that the uterus cannot be displaced forward so as to expose Douglas' culdesac, so that the section can be made from behind – and in these cases the organ is displaced posteriorly,

and the section made anteriorly, on a level with the vesico-uterine culdesac. Sometimes the division may have to be begun in front – and carried on until the posterior adhesions can be separated – and then be completed from behind, as in the original technic. The wound bed is closed in the usual manner.

(*f*) **Abdominal Total Hysteromyomectomy After Delivering the Cervix Through the Incised Posterior Vaginal Fornix and Separating the Organ From Below Upward** – Doyen's Panhysteromyomectomy.—The uterus is delivered out of the cavity and brought as far forward over the symphysis as possible – the object being to expose Douglas' culdesac as well as may be. Upon the protruded end of a pair of forceps or a sound, carried

Fig. 6087.—The Same – 11; – The cervix is grasped by forceps introduced through the incision mad in the floor of Douglas' culdesac, and drawn backward and upward into the pelvic cavity. The begin ning of the separation, by circular section of the cervix from its junctions with the wall of the vaginal dome is seen.

into the vagina from below and projected upward against the vault of the posterior fornix, the uterorectal peritoneal pouch is incised directly into the vagina (Fig. 6086). This initial opening is then enlarged sufficiently for, first, a finger to be carried into the vagina – and then a pair of special curved forceps, which latter are made to seize the cervix and draw it forcibly backward and upward, through the incised posterior fornix, into the recto-uterine pouch, and thence further upward (Fig. 6087). Guided by a finger the vaginal junction with the cervix is circularly divided first along its posterior aspect – and, as the parts are freed, toward its lateral aspects – keeping close to the uterus. As the sides of the cervix are approached the ateral attachments of the lower portion of the broad ligaments are divided. Section at this stage is carried

on with care – recognizing the proximity of the uterine vessels by their pulsation – and exposing them in the field by dissection. These steps are made easier by slight tension upon the forceps-held cervix, while the vessels are being brought into view – and which are then doubly ligated and divided (Fig. 6088). (It is sometimes not possible to tie the uterine vessels until the anterior fornix is incised.) As soon as the vessels are tied and the lateral parametrial tissues have been completely divided, it will be possible to still further free the supravaginal cervix by upward traction. The anterior vaginal fornix is now divided close to the anterior face of the cervix, by continuing the circular division which had been carried to the sides of the cervix. This

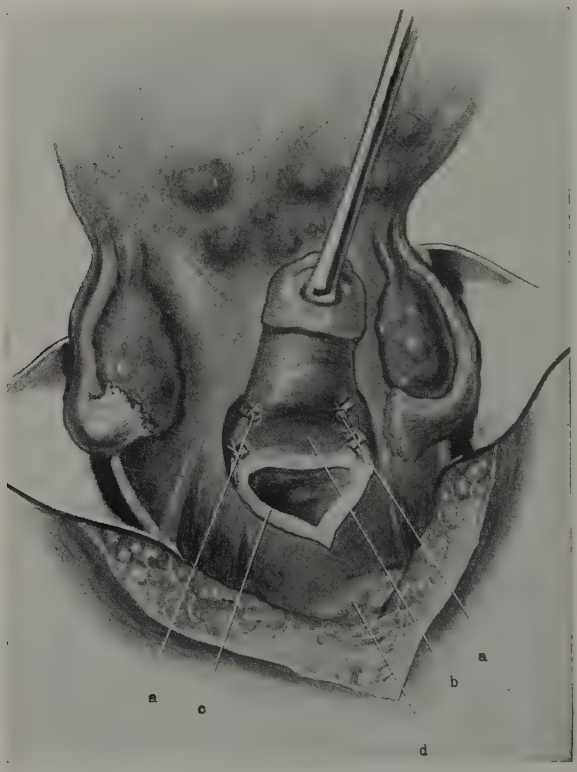


Fig. 6088.—The Same – III; – The cervix has been completely freed, circularly, and drawn forcibly upward – until the peritoneum of the vesico-uterine pouch forms the floor of this part of the wound: **a, a,** Ligated uterine arteries; – **b,** posterior aspect of vesico-uterine peritoneal pouch; – **c,** open vault of vagina; – **d,** rectum.

leaves a circular opening in the floor of the pelvis, representing the junction of the cervix with the dome of the vagina – which is temporarily packed with gauze. It is generally at this stage, after the anterior fornix has been opened and the cervix has been further freed by this section and by continued upward traction, that the uterine vessels are accessible for tying, and the cervical parametrial tissues for dividing. As the cervix is stripped upward, after the division of its lateral vessels and parametrial tissues, the only barrier left between the anterior coporocervical junction and the utero-vesico-peritoneal pouch is the layer of peritoneum covering the face of the uterus – which is incised from behind, against the left index-finger, carried in front,

into the vesico-uterine pouch. After the vesico-uterine peritoneum has been incised, if there be danger to the bladder in the rest of the procedure, it is retracted well forward, which is possible after its mobilization from the neck of the uterus. All that now remains, is to control and divide the broad ligaments. Doyen accomplished this by using the index-finger as a hook, carried over the upper parts of the broad ligaments and backward through the incised vesico-uterine pouch _ controlling the broad ligament of each side in two ligatures and dividing it _ or the broad ligaments may be clamped as shown in Fig. 6089 _ divided between clamps and uterus _ and subsequently ligated.

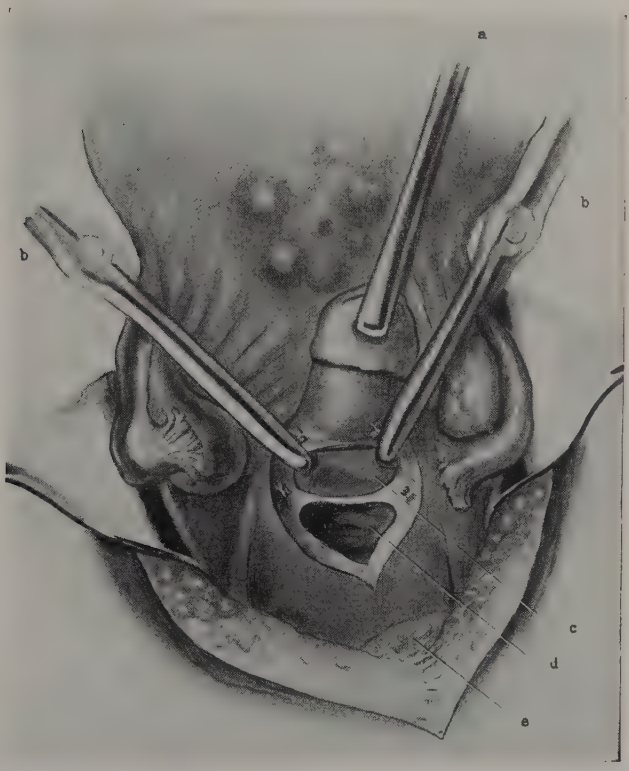


Fig. 6089.—The Same _ IV; _ View from behind: _ a, Tractor upon cervix, which is being freed from its parametrial tissues; _ c, opening in the incised vesico-uterine peritoneum covering the anterior corporo-cervical junction; _ b, b, angiotribes crushing (or clamps grasping) the broad ligaments between their upper free borders and the opening in the vesico-uterine peritoneal pouch; _ d, cavity of the vagina; _ e, rectum.

In closing the pelvic wound the broad ligament pedicles are anchored into the sutured vaginal vault, so as to sustain the latter _ and the peritoneum closed over the entire pelvic floor. The ovaries are retained when possible.

RADICAL ABDOMINAL HYSTERECTOMY FOR MALIGNANCY

Description.—The removal of the entire uterus, ovaries, fallopian tubes, and broad ligaments _ together with the infected or possibly infected para-uterine connective tissue, and the lymphatic vessels and glands which drain all the tracts of possible infection _ as well, often, as the upper part of the vagina.

The chief indication for this extensive operation is cancer of the cervix uteri _ in which the growth is still limited _ not having involved, especially, the base of the bladder, the ureters, nor extended far into the vagina. Involvement of the parametrial tissues, moderate in degree, is of less importance than that of the structures named _ for the radical removal of the parametria is planned as an essential part of the technic in any event. The procedure is also indicated in cancer of the body of the uterus _ but in the latter instance

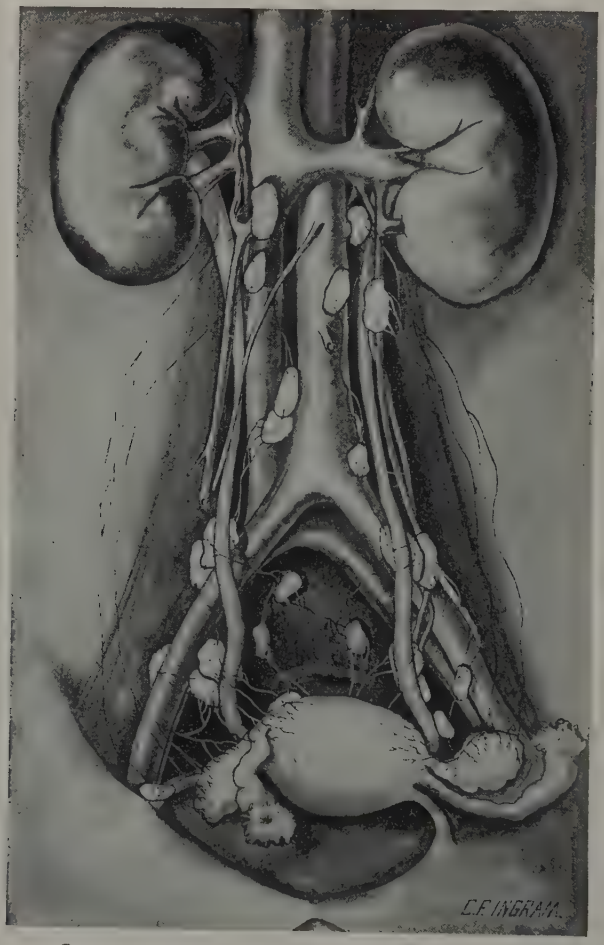


Fig. 6090.—Lymphatic Glands and Vessels of the Female Genital Tract. (Modified from Döderlein and from Kelly.)

the parametrial excisions are usually not quite as extensive as in cervical cancer, as the distributing channels are not so numerous and far reaching. (In the description which follows the removal will be considered to be for cervical cancer, which represents the most extensive surgical technic for this nature of involvement.) Wertheim, contrary to most Surgeons, holds that even advanced uterine cancer should be subjected to the radical operation.

As operation for cancer of the uterus is largely an operative procedure upon the lymphatic tracts of that organ _ just as operation for cancer of the breast

is much more of an operation, as to difficulty and technic, upon the lymphatics connected with the structure _ it behooves the Surgeon to be well posted as to the regional lymphatic tracts which must be invaded (Fig. 6090).

As compared with vaginal hysterectomy for uterine carcinoma, the trend of surgical judgment in favor of abdominal hysterectomy in preference _ as a more surgical and thorough procedure _ is very marked _ and distinctly warrantable. Clark has well put it in stating, "It is unquestionably better to work by sure sight than by uncertain touch. In the abdominal operation the Surgeon sees all stages of his operation _ in the vaginal operation he is compelled to rely upon touch in the most critical part of his work."

The tendency, in operating at the present day, is still toward radicalism, but possibly less extreme radicalism than formerly _ in which, undoubtedly, some patients lost their lives as a direct result of extreme measures in prolonged operations. To remove all the ultimate lymphatic drains of the female organs is, practically, impossible _ as, for instance, those along the abdominal aorta and vena cava. So that in the adoption of radicalism common sense must be intermingled in the recognition of limitations.

The details of the radical operation for uterine carcinoma have been variously modified _ while the fundamental principles in all are essentially the same. Several technics, as worked out by different Operators, will be here given. The preliminaries are practically the same in them all. The warranty for undertaking and continuing the radical operation is supposed to have been decided by preliminary examination _ as far as this is possible prior to opening the abdomen _ and to be finally settled only after opening the abdomen.

Preliminary Preparation.—As a preoperative step to the main procedure the prominent portion of the cervical growth is removed, usually by curetment and cauterization, with galvanocautery, carbolic acid, or tincture of iodin, with protection of the parts by gauze packing. In the original Wertheim technic this was done immediately before the operation _ and this is the method still in vogue among the majority of Surgeons. He held that in this way no time was given for inflammatory reaction and the squeezing out of germs into neighboring tissues during the excochleation. Some Surgeons perform the preliminary curettage under brief anesthesia a week or ten days in advance _ without applying cauterants immediately after, for the reason that cauterization is followed by additional sloughing and soiled discharges _ which, even from the curetment, will be present to some extent. When this interval is allowed to elapse the vagina is at first packed with gauze _ and subsequently a daily disinfecting vaginal douche is given.

The intestinal tract should be empty at the time of operation _ thereby gaining valuable room for manipulations.

The patient's general condition is gotten into as satisfactory state as possible, since shock is one of the chief causes of death from the immediate operation _ and the patient should be fortified in every possible way, constitutionally, in advance, and by the avoidance of unnecessary prolongation, extensiveness of procedure, and loss of blood during the operation.

Immediate Preparation.—The abdominal wall and vaginal outlet are shaved, thoroughly scrubbed, and disinfected in the elected way. The vagina is scrubbed, douched, and is then usually painted with one-third strength of tincture of iodin _ usually followed by gauze packing. When it is possible to accomplish the satisfactory suturing together of the cervix immediately in advance of the operation, this is desirable. But the nature of the local involvement, even after curetment, may make this impossible.

Position.—Horizontal until the abdomen has been opened _ and possibly until after the intra-abdominal examination, or a part of this examination.

has been completed – after which the patient is put into a moderate Trendelenburg position (and into an extreme one by some).

Landmarks.—Those of median infra-umbilical abdominal section.

Anesthesia.—Ether is usually employed – nitrous-oxid-oxygen by some – or nitrous-oxid-oxygen, intermitted with ether, by others. Spinal analgesia is sometimes used to carry the patient as far through the operation as its influence will last, if not entirely – and is then replaced by ether.

Incision.—Long median incision, extending from the umbilicus to the symphysis – and extended above the latter, if required – is usually employed.

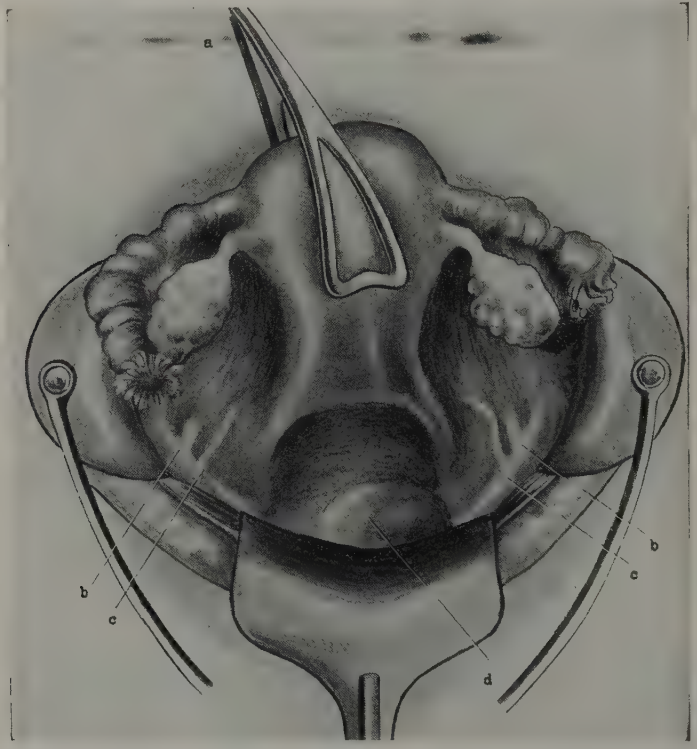


Fig. 6091.—Radical Operation for Uterine Cancer – Wertheim-Bumm Technic – I: – a, Uterus-holding forceps drawing the uterus upward and forward over the symphysis (with the patient in the Trendelenburg position), exposing the posterior aspect of the uterus, broad ligaments, and Douglas' culdesac; – b, b, bifurcation of the common iliac arteries; – c, c, ureters; – d, rectum. (Figs. 6091–6098 modified from Döderlein.)

The necessity for extensive exposure and free manipulation are so great that a considerable incision of approach is required to open up, by retraction, the immediate and secondary fields. A transverse incision carried between the anterior superior iliac is sometimes, though rarely, employed. Wertheim used the Pfannenstiel incision.

Radical Abdominal Operation for Uterine Cancer – Wertheim-Bumm Technic.—The salient features of the combination technic here mentioned are that the operation begins with Bumm's method of opening up the parametrial connective-tissue planes, and isolating the lymphatic structures, keeping them, as far as possible, in two lateral masses, connected with the uterus, with which they are to be removed. At this stage the Wertheim

features of the operation commence, and deal with the freeing of the uterus from its connections, and the control of the upper part of the vagina by special clamp during the final severing of the uterovaginal connections. So many modifications, great and small, have been brought in by so many different Operators that it is rather rare to find any one technic consistently followed in all its details. In the following descriptions mention of the various accepted technical procedures is made in the body of the writing and in the Comments.

The patient comes to the table with the vagina cleansed with bichloridized alcohol and packed with iodoformized gauze. No local preliminary preparation of the cancer itself is made _ fearing dissemination thereby of carcinomatous secretion.

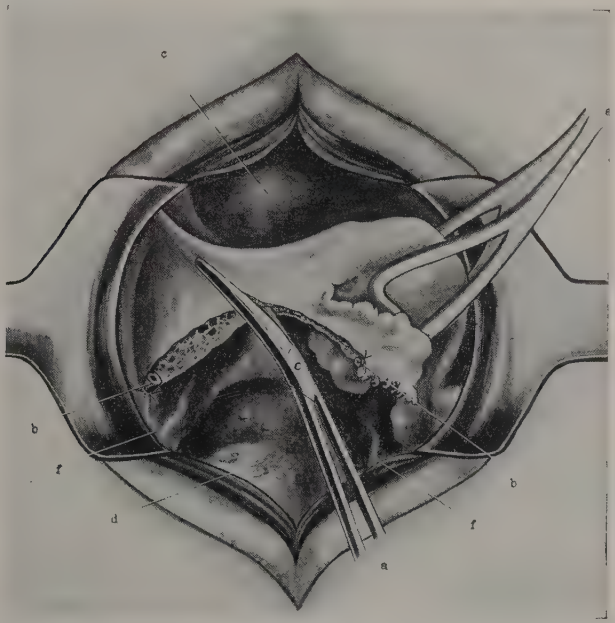


Fig. 6092.—The Same _ II: _ a, The broad ligament, after ligating and dividing the ovarian vessels, is severed from the infundibulopelvic border down to the round ligament _ and then its posterior leaf is split outward along the posterior aspect of the lower border of the round ligament, thus opening up the parametrial connective and lymphatic tissues of the pelvis (Bumm's technic): _ a, Splitting the broad ligament; _ b, b, doubly ligated and divided ovarian vessels; _ c, bladder; _ d, rectum; _ e, tractor drawing uterus to right and tensing left broad ligament; _ f, f, ureters outlined through the peritoneum by tensing that structure through traction upon the uterus.

As soon as the abdomen has been opened, thorough examination of the intrapelvic region is made _ and the warrantability of further prosecuting the operation is determined. This examination may begin in the horizontal and be continued in the Trendelenburg posture. It is to especially discover whether the growth has involved the bladder and ureters _ and whether metastases are present in the parametria, and in the iliac and aortic lymphatic tracts, or in other regions _ that this examination is carefully made _ for subsequent steps depend upon it. When such extensive involvement is found as here implied, the operation is more wisely abandoned than continued.

Owing to the forcible and prolonged retraction of the wound margins Wertheim had the borders of the abdominal opening retracted by hand

throughout the operation. Others have folded red sheet-rubber over these edges and then placed automatic or other retractors against the rubber. The intestines are packed off from the field and held well out of the way during the operation.

The uterus, grapsed by special uterus-holding forceps, is drawn well upward and forward over the symphysis pubis (Fig. 6091). This exposes Douglas' culdesac and its bounding uterosacral ligaments. It also tends, at this stage, to draw the bladder upward along with the uterus, and to put the two ureters upon the stretch, so that their position is often thereby seen through the peritoneum. It is a feature of the technic that the position of the ureters be known and maintained throughout the operation.

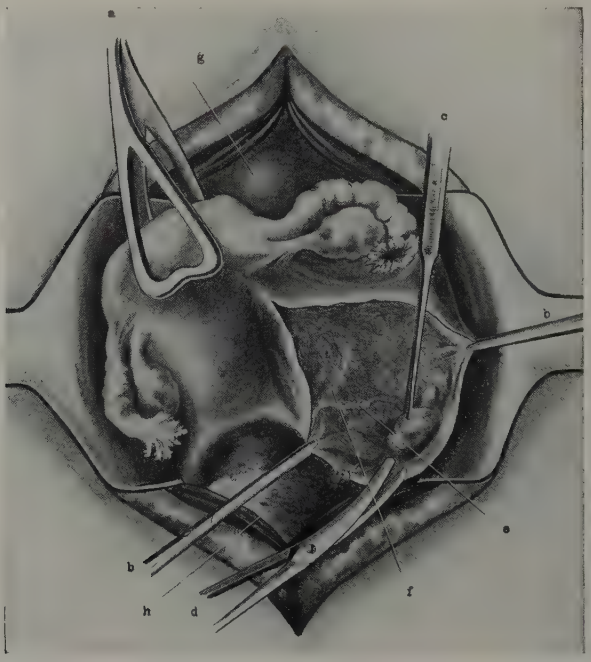


Fig. 6093.—The Same – III; – Excising the deep pelvic lymphatic and connective tissues *en masse* with the uterus: – a, Tractor drawing the uterus to the left, thus tensing the right broad ligament; – b, b, forceps grasping the edges of the split right broad ligament; – c, d, forceps and scissors freeing enlarged lymphatic glands while maintaining their connective-tissue attachments; – e, uterine artery; – f, ureter; – g, bladder; – h, rectum.

The beginning of the operation and the freeing of the deep pelvic lymphatic structures constitute Bumm's technic. He ties the ovarian vessels by ligating them over the free border of the infundibulopelvic ligament. He then divides the broad ligament of one side, outside of the appendages, down to the round ligament (Fig. 6092). He then splits the posterior leaf of the broad ligament outward, along the posterior border of the round ligament (v. Fig. 6092.) Through the separation of the leaves of the broad ligament he works his way, by combined blunt and sharp dissection, into the bed of the deep pelvic connective and lymphatic tissues – passing quickly into the subperitoneal connective-tissue plane, along the parametrial space, to the sides of the pelvic wall – exposing the common iliac and external and internal iliac arteries and veins and the ureter (Fig. 6093).

The dissection of the connective and lymphatic tissues of the deep pelvic spaces is made, as far as possible, *en masse* rather than fragmentarily so_ that these masses, as detached from the sides of the pelvis, will continue to be connected with the uterus _ so that, eventually, they will come away as one mass with it. The lymphatic tissues are thus dug out of the parametrial spaces as it were.

This procedure is repeated upon the second side. The uterine vessels are doubly ligated and divided, by following the ureters from the outer aspects of the pelvis inward _ where they are tied as they cross the ureters _ thereby exposing the latter.

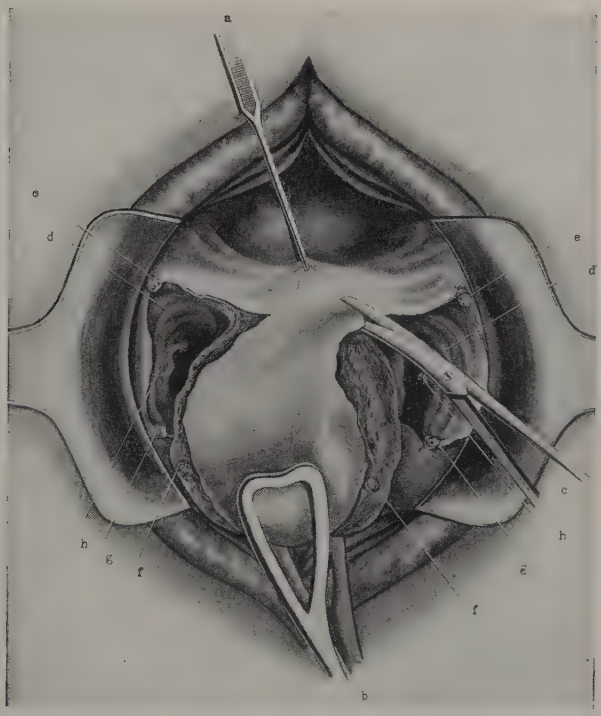


Fig. 6094.—The Same _ IV; _ Dividing the uterovesical peritoneum: _ a, Forceps tensing the uterovesical pouch, while scissors, c, divide the peritoneum over the lower anterior aspect of the uterus during backward traction of the uterus by uterine tractor, b; _ d, d, the parametria are shown freed of their lymphatic and connective-tissue contents, which still cling in large part to the uterus; _ e, e, broad ligament ends of the divided round ligaments _ and, f, f, uterine ends; _ g, g, ligated and divided ovarian vessels; _ h, h, ligated uterine arteries.

From this stage onward the Wertheim technic is followed. The uterus is first displaced backward, so as to tense the uterovesical peritoneum between backward traction upon the body of the uterus and forward traction of the vesico-uterine pouch by forceps _ during which scissors divide the uterovesical peritoneal reflection over the lower aspect of the front of the uterus (Fig. 6094). This section of the peritoneum and its subsequent forward retraction is more difficult than in the case of the posterior peritoneum of Douglas' culdesac _ because of the close adherence of the bladder to the corporocervical aspect of the uterus. When this has been accomplished, and the detached peritoneal fold, togehter with the bladder, have been displaced forward by blunt dissection and retraction, the uterus is, in turn, brought forward _ so

as now to expose its posterior aspect. While thus held the uterorectal peritoneum is incised with scissors over the lower posterior aspect of the uterus (Fig. 6095) _ which is an easier accomplishment than is the incising of the reflection over the anterior aspect of the uterus, because of the much lower and looser relations of the rectum. The freed fold of peritoneum is then bluntly dissected downward from the posterior aspect of the uterovaginal junction.

In carrying on the separation of the uterovesical peritoneal fold anteriorly progress is sometimes interfered with by infiltration of the vesical wall, and even of the vesical ends of the ureters. In these cases decision will have to be reached as to whether a portion of the bladder is also excised, with closure of the remaining bladder _ as well as excision of the vesical ends of the ureters, with the implantation of the ureteral stumps elsewhere.

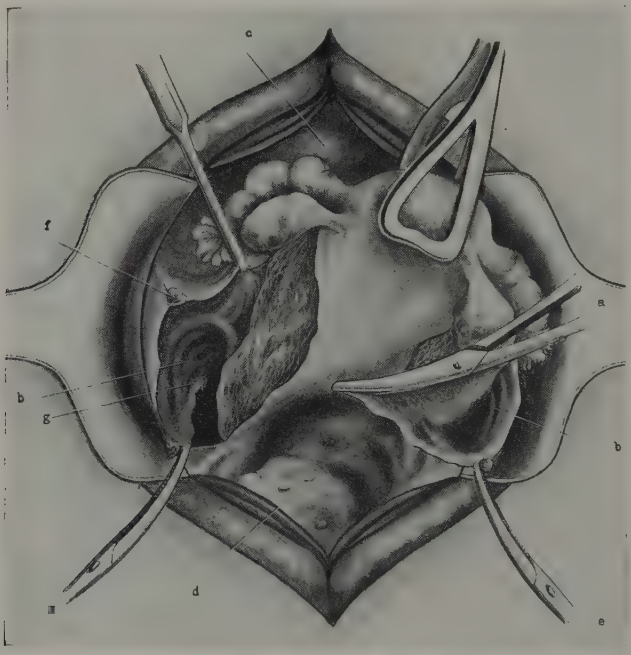


Fig. 6095.—The Same _ V; _ Dividing the uterorectal peritoneum: _ a, Severing the uterorectal pouch over the lower posterior aspect of the uterus; _ b, b, parametrial spaces freed of connective and lymphatic tissues; _ c, bladder; _ d, rectum; _ f, broad ligament end of left round ligament; _ e, e, ligated ovarian vessels; _ g, ligated left uterine artery.

When the posterior aspect of the lower uterine wall is freed of peritoneum the uterosacral ligaments are divided _ thereby largely adding to the mobilization of the uterus.

The uterus is now only held by its connection with the vagina _ the dome of which is to be removed along with the uterus. To this end the uterus is drawn well upward, putting also the vagina under tension _ and, while thus held, the Wertheim angular vaginal clamp is applied to the vault of the vagina immediately above the level at which it is to be divided (Fig. 6096). This use of the clamp is an essential feature of the Wertheim technic _ its object, besides being a mechanical holder, is to prevent the squeezing back into the circulation and over outlying structures, cancer cells and secretions from the site of lesion, during the final act of removal. Any gauze packing

which may have been placed in the vagina at the commencement of the operation is, of course, removed before the division of the vagina. The section of the vagina is made transversely from side to side – and as soon as the beginning of the section is made the exposed vaginal wall is lightly seized with clamps to keep it from retracting out of convenient reach. And as soon as the division is completed thread tractors are inserted to replace the clamps (Fig. 6097).

In closing the wound the vaginal opening is sutured in the manner illustrated in Fig. 6098 and described in the legend. Or, as might be more generally carried out, the anterior and posterior margins of the vaginal opening

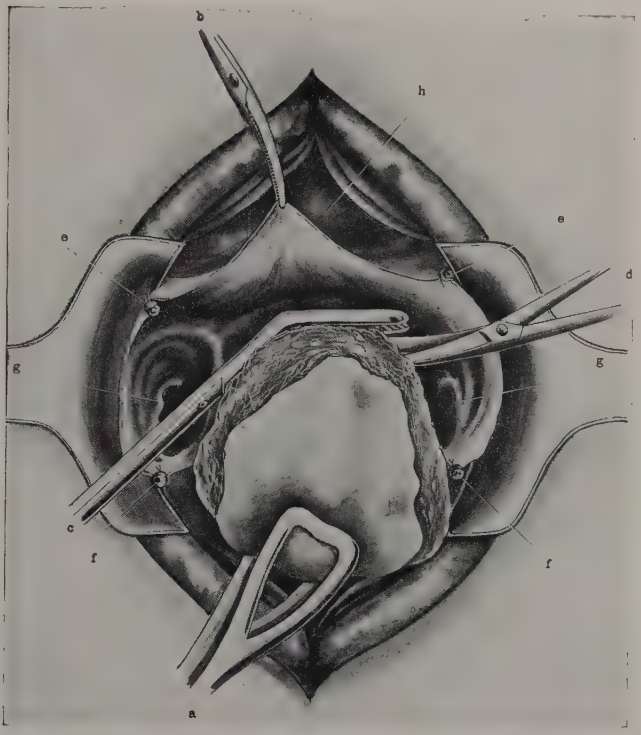


Fig. 6096.—The Same – VI; – Dividing the upper vaginal walls: – **a**, Upward traction of uterus; – **b**, forward traction of uterovesical peritoneum; – **c**, Wertheim's angular clamp compressing the upper part of the vagina; – **d**, scissors dividing the upper portion of the vagina just below the clamp, which compresses the parts and retains all secretions within the parts to be removed; – **e, e**, round ligaments; – **f, f**, ovarian vessels; – **g, g**, ligated uterine vessels, seen in parametrial spaces, from which all lymphatic and connective tissues have been removed; – **h**, bladder.

may be first sutured together – approximating raw margin of vagina to raw margin – and then the margins of vesical and rectal peritoneum are sutured together over the closed vaginal vault. Finally, the anterior and posterior separated leaves of the broad ligaments are sutured together over the parametrial spaces, emptied of their connective and lymphatic tissues – the union of the margins of the peritoneum everywhere burying in all ligated stumps of round ligaments and vessels. Where drainage is indicated, this is instituted through the partly closed vagina or through what remains of Douglas' pouch.

Comments.—The greatest fundamental difficulty as to being able to successfully operate upon uterine cancer, especially the cervical variety, is

its early implication of the bladder, ureters, vagina, rectum, and parametrial glands _ rendering effort so often fruitless.

The necessity for avoiding the distribution of cancer cells over the pelvic wound _ thereby engrafting these cells in new sites _ is imperative. It is held that patients sometimes die sooner from this cause than they would probably have died if not operated upon at all. This emphasizes a now accepted principle _ that in all cancerous involvements it is wise to begin the surgical attack at the furthest outlying sites of involvement and then progress inward toward the original or main focus _ thereby lessening the chance of squeezing back cancer cells and fluids into the circulation or upon the raw tissues.

Fig. 6097.—The Same _ VII; _ Denuded and dissected floor of pelvis after removal of uterus and upper vagina: _ a, Bladder; _ b, rectum; _ c, c, divided vagina, whose anterior and posterior walls are kept from retracting by temporary thread tractors; _ d, d, parametrial spaces freed of lymphatic and connective tissue; _ e, e, ureters; _ f, f, uterine arteries; _ g, g, ovarian vessels ligated; _ h, h, round ligments ligated.

It is now amply demonstrated that lives are saved in much larger numbers by earlier and more limited operation before dissemination has taken place _ than by far more radical operation later, when the most that is accomplished in many cases is the intention and effort to remove all outlying foci of infection without definitely knowing that this has been accomplished, and, indeed, in many instances without being able to accomplish complete removal as a surgicomechanical feat.

Among the chief causes of fatility in these cases are _ the poor condition of many of the patients because of the nature of the involvement _ shock from loss of blood and the prolonged nature of the operation _ heart and kidney strain _ sepsis _ reimplantations of the growth _ recurrence.

When the nature of the cervical involvement is such as to make the closure

of the cervical lips possible, they are often sutured together as a preliminary step to the operation.

A good suggestion made by Giles is at the beginning of the intra-abdominal operation to tie two ligatures around the ovarian ligaments at the cornua of the uterus and leave their ends long – to be used as tractors throughout the rest of the operation, as manipulation of the uterus by these means does not compress the organ as do any form of clamps, with the consequent risk of dissemintation of cancer products.

The exposure of the ureters and the ligation of the uterine arteries are among the most difficult parts of the operation. He accomplishes this part of the

Fig. 6098.—The Same – VIII; – Closing the pelvis bed; – The vesical peritoneum and anterior vaginal lip are first sutured together – and the rectal peritoneum and posterior vaginal lip are similarly sutured together – then sutures are carried through these composite lips in somewhat Lembert fashion, so that serosal union ultimately takes place between the vesical and rectal peritoneal surfaces. The lateral lines of peritoneal union are curvilinear, and correspond with the general direction of denudation and parametrial dissection. The ligated stumps of the round ligaments and of ligated vessels are infolded in the act of suturing – so that no raw surfaces are left exposed.

procedure, after displacing the uterus to the opposite side, by first locating the ureter through the posterior layer of the broad ligament either by picking it up between the fingers, near the site of ligating the ovarian vessels – or by incising the base of the broad ligament parallel with its direction. It is then located in its bed, and an aneurysm needle passed beneath it, by which it is lighted up and traced to the lateral aspect of the cervix – but with as little disturbance of its blood-supply as possible – in its passage through the "ureteric canal" (a less dense corridor of connective tissue passing beneath the uterine artery at right angles). The finger follows the ureter through this channel, and raises its roof, which contains the uterine artery, upon the finger (v. Fig. 6102). Each end of this connective-tissue roof is clamped and divided – thereby exposing the ureter – and the divided ends of the uterine vessels, which are

doubly ligated, and the clamps removed. The ureter can then be traced to the bladder – but, again, with care of its blood-supply, else necrosis and leakage may follow. In the further steps of this technic the parametrial connective and lymphatic tissues, in the opened plane of the broad ligament, is clamped at the outer pelvic walls – and is dissected up *en masse* toward the uterus. with which it retains its connection and together with which it is finally removed. The uterus and vagina are then drawn well upward – and, while the bladder, ureters, and rectum are retracted from the immediate field, the upper part of the vagina is clamped, through healthy tissue, and transversely divided, Finally, the connective and lymphatic tissues along the uterine and iliac vessels as far, if possible, as the aortic bifurcation are dissected away *en bloc.*

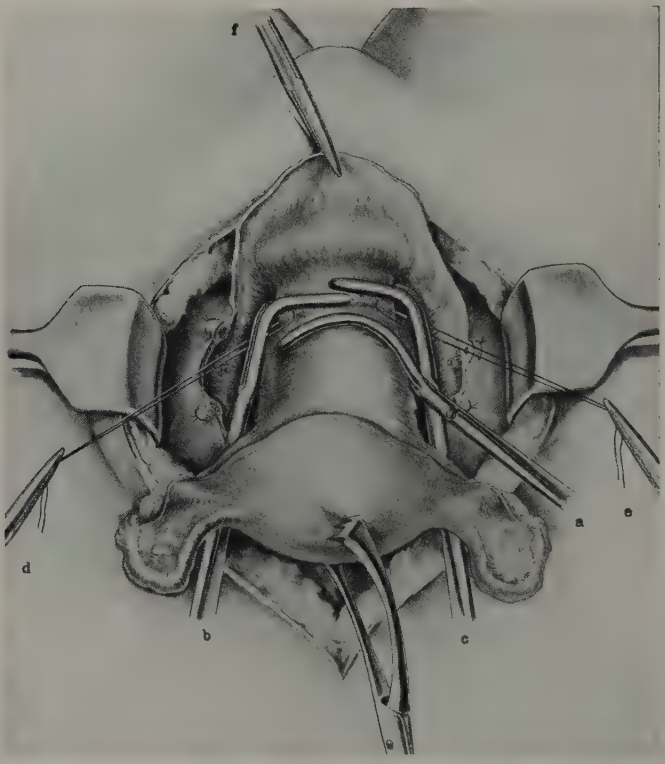


Fig. 6099.—Wertheim's Technic in Separating the Uterus from the Vagina in Radical Abdominal Hysterectomy: – a, Cervical clamp; – b, c, vaginal clamps; – d, e, thread tractors to control the upper margin of the vagina when the vagina is severed from the cervix; – f, incised fold of vesico-uterine fold of peritoneum, including the bladder, drawn forward.

Sometimes a cuff of the upper vagina is dissected up, turned down, and sutured together over the cervix, as a preliminary step to the main operation – but the procedure may be difficult – especially if infiltration be present.

In ligating and dividing the broad ligaments in the earlier stages of the operation many Surgeons carry out these steps in exactly the same manner in which they apply them in ordinary supravaginal hysterectomy – except that the ligatures of the broad ligament structures are placed further outward toward the pelvic walls – for the reason that more of the parametrial tissue is planned to be removed.

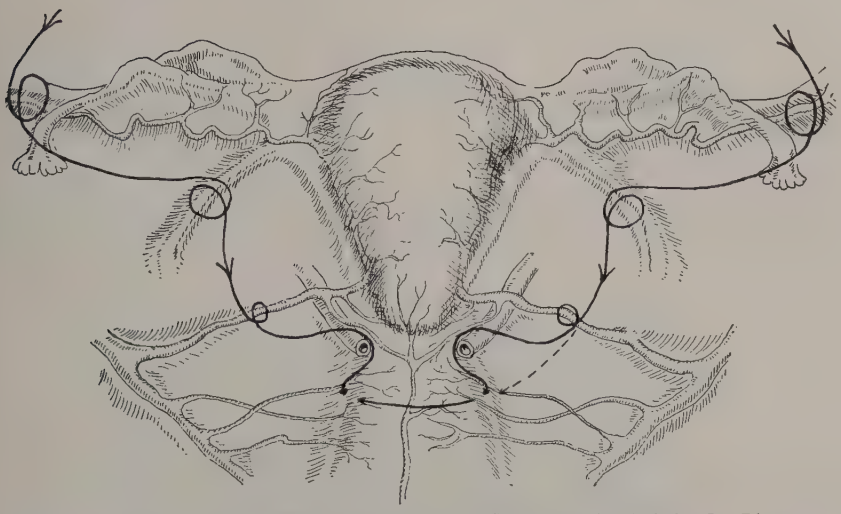


Fig. 6100.—Radical Abdominal Operation for Uterine Cancer – Kelly Technic – I; – Diagrammatic outline of the structures to be removed – included within the lines of ligature.

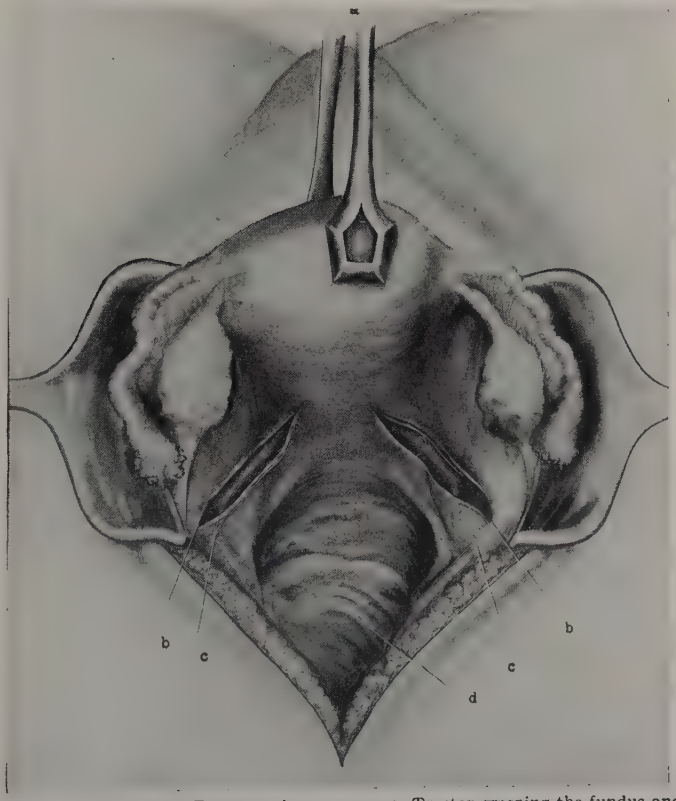


Fig. 6101.—The Same – II; – Exposing the ureters: – a, Tractor grasping the fundus and drawing it upward and forward to expose and tense the posterior aspect of the broad ligaments; – b, b, the posterior layer of the broad ligaments incised over the course of the ureters; – c, c, ureters crossing either the common or external iliac arteries.

If difficulty be experienced in recognizing the ureters after incising the posterior aspect of the broad ligaments, they can usually be found by picking up the connective tissue between thumb and finger until a soft, non-pulsating, cord-like body is felt. It is much wiser to separate the ureters from their beds as little as possible for fear of causing necrosis and consequent ureteral fistula by interfering with their vascular supply.

Wertheim applies three clamps in the manner shown in Fig. 6099 before dividing the vagina _ both to prevent cancer dissemination from the uterus _ and infection from the vagina. Temporary traction sutures are also passed through the vaginal wall to hold it in the field when the clamps have been

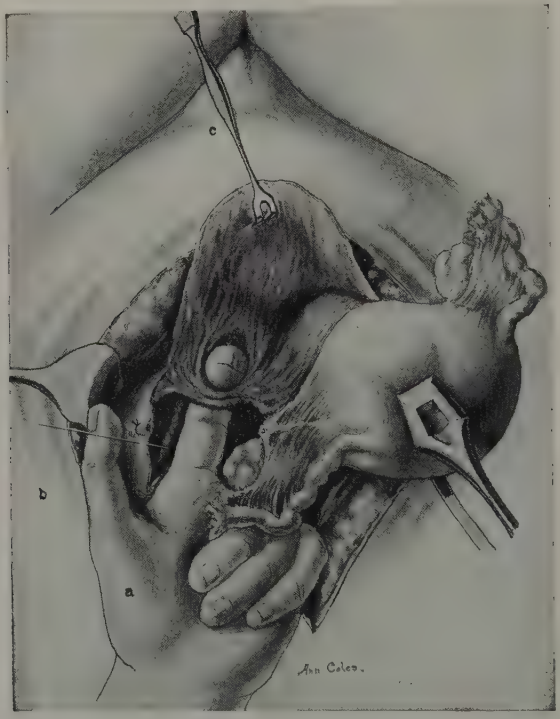


Fig. 6102.—The Same _ III; _ Tunneling through the ureteric canal with the finger a, after having located the ureter, b _ the pulp of the finger raising a bridge of paracervical tissue containing the uterine vessels. In this technic the ureter is protected by the back of the finger _ (it is here shown slightly to one side of the finger); c, forward retraction of the incised vesico-uterine peritoneal flap, including the displaced bladder.

removed. In concluding the operation the vaginal walls and paravaginal tissues are brought together laterally, leaving space in the center for a double rubber-covered gauze drain _ which drains the parametrial and paravaginal spaces beneath the sutured peritoneum. The removal of the lymphatic glands is the last step of the operation prior to suturing the peritoneal margins over the pelvic wound area.

Radical Abdominal Operation for Uterine Cancer _ Kelly Technic.—The summary of this method of conducting the radical operation, as performed by Clark, will be here given. He limits the application of the operation, in so far as likehood of ultimate success is concerned, to cases of cancer which have not progressed beyond their earlier stages _ and in the scope of the tech-

nical work done within the abdomen the extent of radicalism has been somewhat reduced from the original extremes.

The ureters need not be systematically catheterized in advance _ but this should be done in those cases where preliminary vaginal examination points to the likelihood of involvement in the neighborhood of the ureters. While the ureters may usually be readily located after the abdomen is opened, and especially after the parametrial spaces are incised, yet this is not invariably the case _ and very great difficulty, if not impossibility, of finding them is sometimes experienced _ with all of the hazards of wounding them.

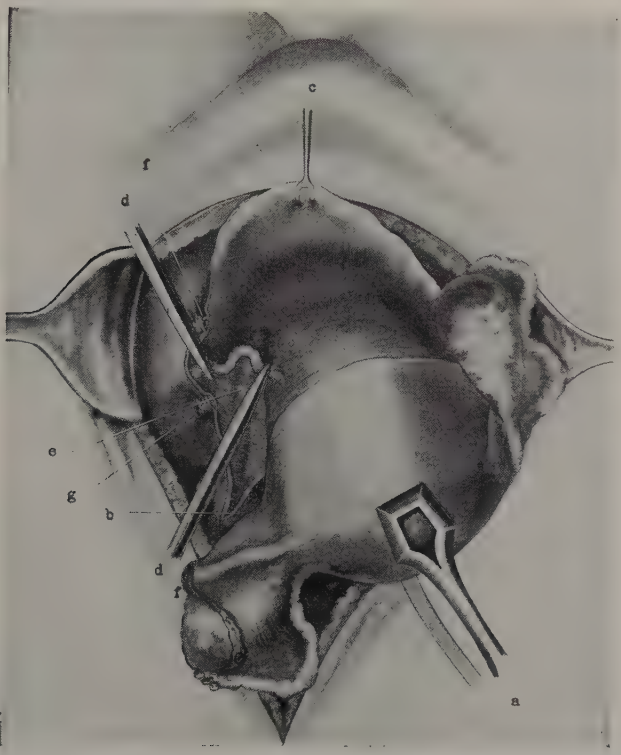


Fig. 6103.—The Same _ IV; _ Freeing the uterovesical peritoneum and ligating the uterine vessels: _ a, Tractor displacing the uterus posteriorly and to the opposite side, exposing its anterolateral aspect, across which the peritoneal incision, begun posteriorly at b, is continued anteriorly; _ c, traction upon the separated fold of uterovesical peritoneum; _ d, d, left uterine artery (the veins are not shown) is being doubly clamped or tied, ready to be divided; _ e, left ureter passing forward beneath the uterine vessels; _ f, f, severed round ligament ligated distally; _ g, severed ovarian ligament ligated distally.

The general scope of the operation is shown in Fig. 6100.

The abdomen is opened in the median line, with the patient in a moderately high Trendelenburg position, through an incision extending from the navel to the symphysis. As soon as the abdominal wound is retracted and the intestines displaced the final examination is made _ upon which will be decided the continuance or discontinuance of the operation. This review includes, especially, the following parts _ the contiguous portion of the bladder, ureters in proximity to the bladder, vaginal walls and paravaginal tissues, uterosacral ligaments, and rectum. The broad ligaments are examined by compressing these structures between the thumb and fingers in passing outward from

the uterus to the pelvic walls – examining especially to see whether there be enlarged lymphatics in the parametrial tissues and at the iliac bifurcations. Sometimes the sacral glands are enlarged, without corresponding enlargement of the broad ligament glands. Clark summarizes the interpretation of secondary lymphatic involvement in the following words: – "If glandular metastases or wide-spread extension is not discovered, the radical local extirpation offers the greatest possibility of a cure. If extension of the cancer is palpably evident in the iliac or sacral glands, the operation should be limited to a simple hysterec-

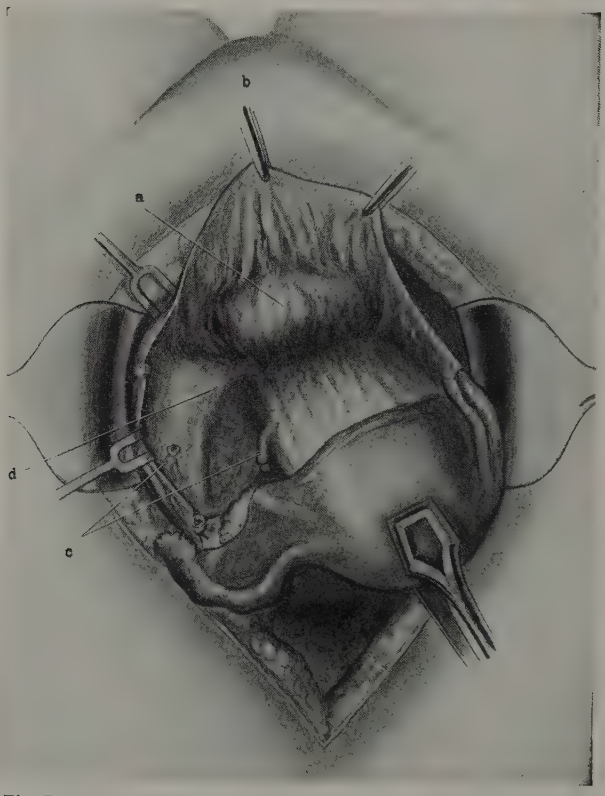


Fig. 6104.—The Same – V; – Freeing the bladder from the anterior uterocervical wall; – the peritoneum of the anterior aspect of the uterus has been freed down to the bladder, which, together with it, is further freed and drawn forward, exposing the cervicovaginal junction – and also the parametrial spaces: a, Bladder; – c, vesico-uterine peritoneal fold; – c, doubly ligated left uterine artery divided; – d, ureter. The round ligaments and ovarian ligaments have been ligated distally and divided.

tomy or high amputation with the cautery, eradicating as completely as possible the local site of the disease."

The intestines having been packed off with gauze bolsters wrung out in hot saline, the fundus of the uterus is seized with tenaculum forceps (rather than with the instrument pictured), and drawn first to one side and then the other, in the manipulations of exposure. Displacing the uterus forward, the posterior leaves of the broad ligaments are incised – the incision beginning over the iliac bifurcation, and extending obliquely inward, over the course of the ureters to their vesical ends (Fig. 6101) – this part of the technic corresponding with Bumm's part of the Wertheim-Bumm procedure. The infun-

dibulopelvic ligaments are next doubly ligated and divided outside of the appendages – and the broad ligaments divided down to the round ligaments, which are also doubly ligated at 2.5 (1 inch) from the cornua, and cut. The use of double ligatures, with division between, avoids the confusion and room encroachment caused by employing a number of clamps.

The uterovesical peritoneal reflection is now divided transversely from side to side, over the lower aspect of the anterior uterine wall, being continuations of the original posterior incisions forward – after which the bladder is freed by blunt dissection and retracted forward (Fig. 694). This anterior

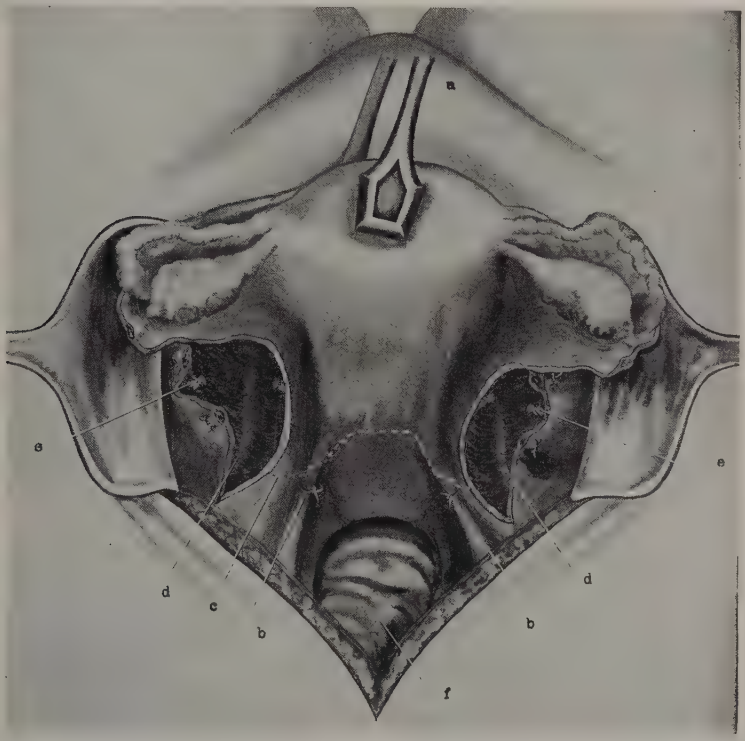


Fig. 6105.—The Same – VI; – Dividing the posterior uterine connections: – a, The clamped uterus is drawn well forward and upward, exposing the posterior structures; – b, b, ligatures of the uterosacral ligaments, here shown merely to designate their position – being placed, as they are, after division of the structures; – c, line of transversely curved incision of the recto-uterine peritoneal reflection, over the lower aspect of the uterus, through Douglas' culdesac; – d, d, ureters seen in the parametrial spaces; – e, e, doubly ligated and divided uterine vessels; – f, rectum.

transverse incision is carried into the lower ends of the oblique incisions made over the ureters earlier in the operation – and the parametrial connective tissue opened up by blunt dissection while the uterus is drawn well upward and to the opposite side – reversing the maneuvers when the second side is being manipulated. The blunt dissection of the parametrial tissues is carried into the paravaginal tissues of the two sides – the walls of the vagina being thereby mobilized in their upper part.

The ligation of the uterine vessels is undertaken in conjunction with the prior localization of the ureters – which is accomplished either by defining the ureteral bougies which have been previously placed – or, in their absence

by tracing the ureters down from the pelvic brims to the sites where they curve inward to reach the vesical neck _ and then lifting upward with the finger-tip the connective tissue overlying the ureters _ in which lie the uterine vessels (Fig. 6102). The vessels are isolated in this tissue _ and are doubly ligated and divided at some little distance to the outer aspect of the uterus rather than in close proximity to it (Fig. 6103).

The broad ligaments are now severed from their attachments to the pelvic walls well to the outer side of the uterine appendages _ until the uterus retains only its connection with the vagina and with its posterior structures (Fig. 6104). The organ is then drawn upward, and forcibly forward, over the sym-

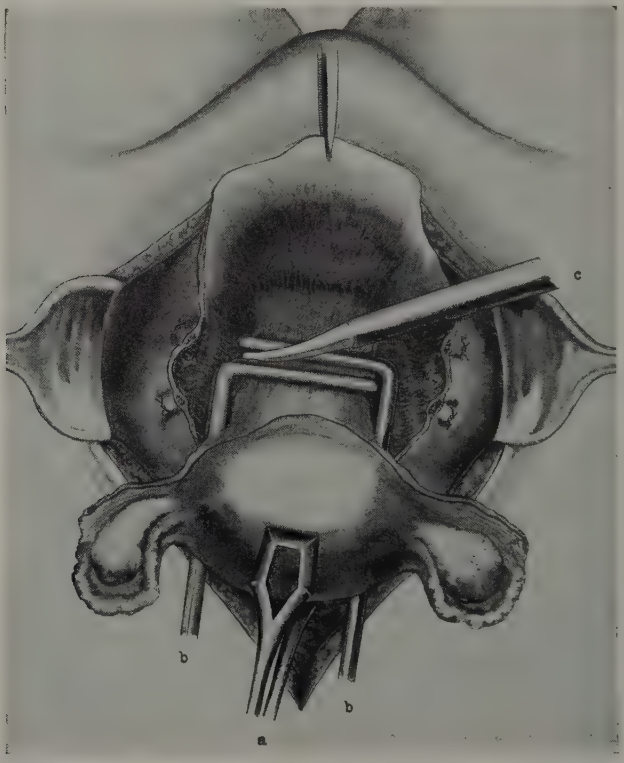


Fig. 6106.—The Same _ VII; _ Dividing the vagina: _ a, Uterine tractor; _ b, b, Wertheim angular clamps grasping and securely closing the upper part of the vagina, through healthy tissue, below the cervix uteri _ thereby preventing escape of both uterine and vaginal contents into the wound field; _ c, actual cautery dividing the vagina between the clamps _ the neighboring parts being protected by wet gauze (not here shown).

physis. While thus held, with its posterior structures tensed, the uterorectal peritoneum is transversely divided over the lower aspect of the uterus (Fig. 6105) _ and is then pushed downward with a gauze-covered finger _ freeing the posterior aspect of the upper vaginal wall below the level of the cervix and exposing the uterosacral ligaments _ which are ligated and divided rather near the sacrum. The uterus is now free _ but for its vaginal attachment.

The uterus is now drawn forcibly upward _ so as to bring into the field as much of the mobilized vagina as possible _ and two right-angled clamps

are made to grasp the vagina through healthy tissue as near the cervix as vaginal tissue, safely healthy, can be located (Fig. 6106). These clamps are applied from opposite sides of the exposed and mobilized vagina _ and just far enough apart to allow of division of the vaginal vault between them _ a little nearer to each other, if the division is to be made by knife or scissors, than if made by cautery knife _ Clark employing the actual cautery (and stressing its employment) in dividing both the pelvic attachments of the broad ligaments and in the division of the vagina _ and, in addition, even sear-

Fig. 6107.—The Same _ VIII; _ Closing the divided vaginal canal: _ a, Vaginal Wertheim clamp still in place _ the margins of the excised vaginal dome ready to be closed with interrupted through-and-through sutures at either end, the center generally being left unsutured for gauze drainage of the sub-peritoneal wound space into the vagina; _ b, ligated round ligament; _ c, uterine vessels; _ d, ovarian vessels; _ e, bladder; _ f, vesico-uterine peritoneum; _ g, rectum; _ h, recto-uterine peritoneum; _ i, i, ligated uterosacral ligaments (here again shown outside rather than under the peritoneum); _ j, j, ureters. The parametrial spaces, emptied of their connective and lymphatic tissues, are seen.

ing the stumps left after the cautery division, after thoroughly protecting adjacent structures.

The uterus and its attached structures are lifted away in the grip of the upper clamp _ with all avenues of escape of cancerous exudate sealed off. The upper opening of the vagina, still controlled by the lower clamp, is to be dealt with according to circumstances. If it is to be closed entirely, a line of interrupted, continuous, or mattress suturing is carried across the opening _ generally below the vaginal clamp _ or, if this have not been applied tightly enough to pulpify the tissues and endanger their vitality by pressure

(and there is not reason to close it other than lightly), the sutures are placed above the clamp – as shown in Fig. 6107. It is to be remembered that union must occur through granulating surface if the actual cautery be used. As a rule, however, only the lateral aspects of the vaginal opening are closed – making provision for subperitoneal drainage of the pelvic wound through the center of the opening (Fig. 6108) – the lateral aspects of the extensive denudation communicating, beneath the sutured pelvic peritoneum, with the vaginal drain (in the general manner shown in Fig. 6108.

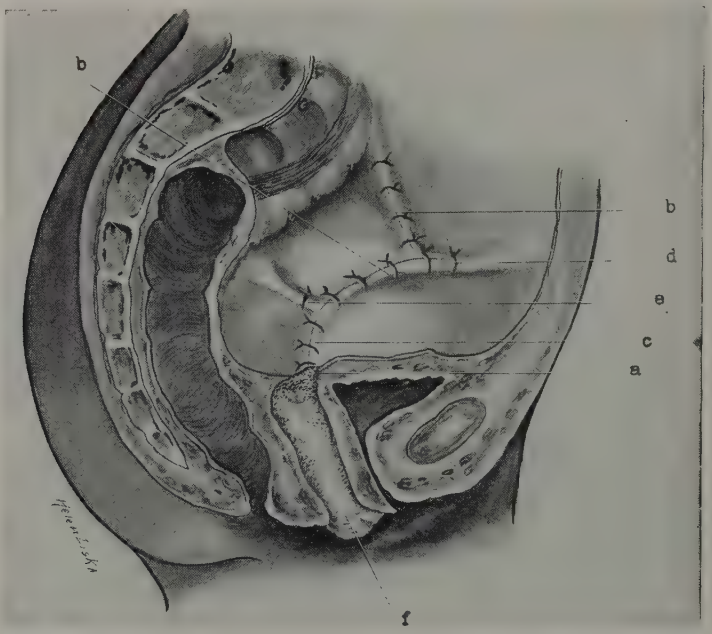


Fig. 6108.—The Same – IX; – Closing the pelvic wound bed – seen in section: – **a**, Vaginal dome, the sides of which have been sutured, leaving a median portion of the vaginal lips unsutured, so that the vaginal drain, **f**, can pass upward into direct contact with the pelvic peritoneum sutured over the entire pelvic wound, giving common drainage from that extensive wound into the vagina; – **b, b**, sutures of the free borders of the broad ligaments and ends of the ovarian ligaments and vessels; – **e**, ligature of the left utero-sacral ligament (which should, again, be beneath the sutured peritoneum); – **d**, position of the ligated round ligament underlying the peritoneum; – **c**, approximation of the margins of the vesico-uterine and recto-uterine peritoneum over the floor of the pelvic wound.

Finally, the margins of the vesical and rectal aspects of the divided peritoneum are brought together by suture over the pelvic floor – burying in all raw tissue and all ligated stumps of vessels and ligaments. The abdominal wound is closed in the usual manner.

If shock be present during the operation abundant hot normal saline solution is given as colonic enemata during the procedure – and 2 pints left in the abdomen at the close of the operation – unless vaginal drainage be employed. Also submammary infusion may be used. The bladder is catheterized at the end of the operaton.

CHAPTER XCIII

OPERATIONS UPON THE PREGNANT UTERUS—AND ITS CONTENTS

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In explanation of including natural labor in the present chapter, it may be said that normal labor is a physiologic process _ in which no aspect of operative surgery ordinarily enters. So many phases of operative surgery, however, enter into some phase of such a large proportion of non-normal presentations and conditions of the fetus, in abnormal labors and states, that warranty for including the operative surgery aspect of these cases is apparent. And since the intelligent application of operative relief cannot be applied to these cases without having a clear understanding of normal presentations and normal labor _ as bases of departure in the abnormal _ physiologic presentations and labor have been first considered, before their operative bearings.

DIAMETERS, PLANES, AND AXES OF THE FEMALE PELVIS

Diameters of the Female Pelvis.—Pelvic Inlet (brim or superior strait _ Fig. 6109): Bounded anteriorly by the symphysis pubis and horizontal rami of the pubis bones _ posteriorly by the sacral promontory and alæ _ laterally by the linæ pectineæ.

Anteroposterior Diameter (true conjugate): From the middle of the sacral promontory _ to the center of the posterior aspect of the upper border of the symphysis pubis _ 11.5 cm. ($4\frac{1}{2}$ inches). (The obstetric conjugate is a few

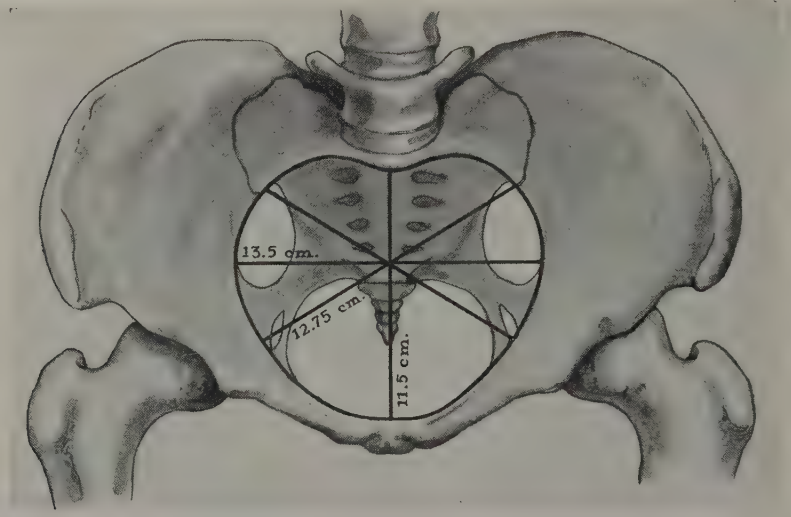


Fig. 6109.—Diameters of the Inlet of the Female Pelvis _ and their approximate measurements. (Figs. 6109–6113 modified from Bumm, Edgar, and Williams.)

millimeters shorter owing to the convexity of the posterior aspect of the symphysis.)

Transverse Diameter: Greatest distance between the lineæ pectineæ _ crossing the anteroposteior diameter at right angles _ 13.5 cm. ($5\frac{1}{2}$ inches).

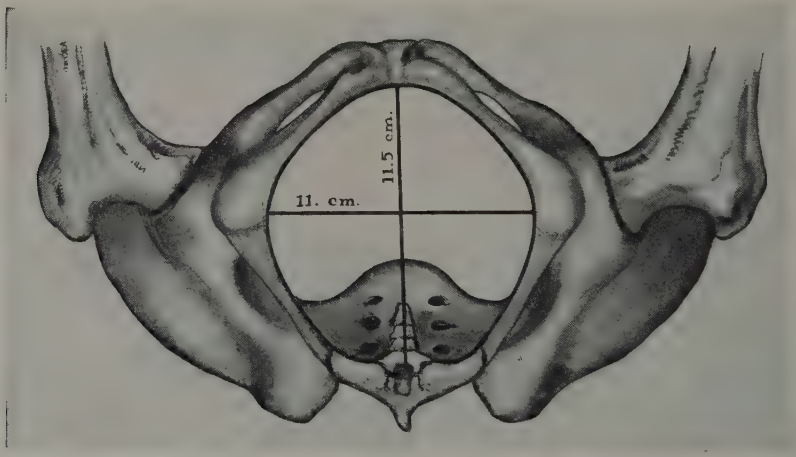


Fig. 6110.—Diameters of the Outlet of the Female Pelvis _ and their approximate measurements.

Right Oblique Diameter: From the right sacro-iliac synchondrosis _ to the left iliopectineal eminence _ 12.75 cm. (5 inches).

Left Oblique Diameter: From the left sacro-iliac synchondrosis _ to the right iliopectineal, eminence _ 12.75 cm. (5 inches).

Pelvic Cavity: Space between the pelvic inlet and outlet _ bounded, anteriorly, by the symphysis pubis _ laterally, by the innominate bones _ posteriorly, by the hollow of the sacrum and coccyx.

Anteroposterior Diameter: From the center of the posterior aspect of the symphysis pubis in the median line _ to the junction of the second and third sacral vertebræ in the median line _ 12.75 cm. (5 inches).

Transverse Diameter: Line between the two ischial spines, crossing the anteroposterior diameter at right angles _ 12.75 cm. (5 inches).

Right Oblique Diameter: From the center of the right great sacrosciatic foramen _ to the center of the left ischiopubic foramen _ 13.25 cm. ($5\frac{1}{4}$ inches).

Left Oblique Diameter: From the center of the left great sacrosciatic foramen _ to the center of the right ischiopubic foramen _ 13.25 cm. ($5\frac{1}{4}$ inches).

Pelvic Outlet (inferior strait _ Fig. 6110): Bounded, anteriorly, by the subpubic ligament _ posteriorly, by the coccyx _ laterally, by the ischiopubic rami, ischial tuberosities, and greater and lesser sacrosciatic ligaments.

Anteroposterior Diameter: From the center of the subpubic ligament _ to the tip of the coccyx _ 9.5 cm. ($3\frac{3}{4}$ inches) _ or 11.5 cm. ($4\frac{3}{4}$ inches), if the coccyx be bent backward.

Transverse Diameter: Line between the ischial tuberosities _ 11 cm. ($4\frac{1}{4}$ inches).

Right and Left Oblique Diameters _ are usually not given at the outlet.

Summary of the Diameters of the Female Pelvis::

	Inlet, centimeters.	Cavity, centimeters.	Outlet, centimeters.
Anteroposterior	11. 5	12.75	11.5
Transverse	13. 5	12.75	11.0
Oblique	12.75	13.25	

Planes of the Female Pelvis (Fig. 6111).—Imaginary levels at different positions of the pelvic cavity _ usually taken at the inlet, in the cavity, and

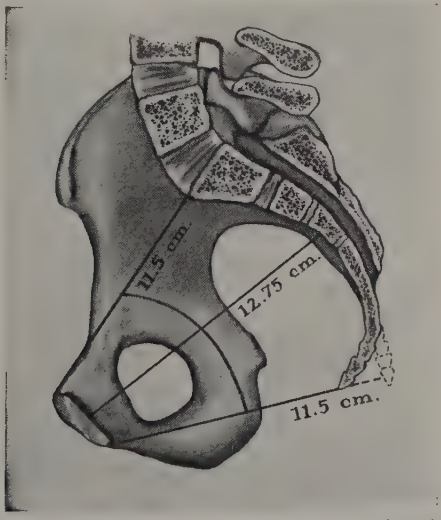


Fig. 6111.—Planes and Axes of the Female Pelvis _ seen in sagittal section _ and their approximate measurements.

at the outlet of the pelvis _ and represent the largest plane (greatest measure-

ment) at the special level. The chief planes are the superior plane, midplane, and inferior plane.

Axes of the Female Pelvis (v. Fig. 6111).—The axis of the pelvis, as a whole, represents the direction taken by the child in its expulsion. The curvilinear line drawn through the points made by bisecting each pelvic diameter, midway between its anterior and posterior boundaries, will give the channel or axis of the pelvic canal.

THE SUTURES, FONTANELS, LANDMARKS, DIAMETERS, AND PLANES OF THE FETAL HEAD

Sutures of the Fetal Head (Figs. 6112 and 6113):

Frontal _ uniting the two frontal bones.

Sagittal _ biparietal _ uniting the two parietal bones.

Coronal _ frontoparietal _ uniting the two frontal bones with the two parietal bones.

Lambdoidal _ occipitoparietal _ uniting the two parietal bones with the occipital.

Fig. 6112.—Sutures, Fontanels, Landmarks, and Diameters of the Fetal Head _ Lateral View.

Temporal _ squamous _ uniting the frontal and parietal bones, above, with the sphenoid and temporal below _ this suture playing no rôle in obstetric surgery.

Fontanels of the Fetal Head (v. Figs. 6112 and 6113):

Anterior or Great Fontanel _ bregma _ diamond-shaped, membranous junction of the frontal, sagittal, and coronal sutures.

Posterior or Small Fontanel _ triangular, membranous junction of the sagittal and occipital sutures.

Landmarks of the Fetal Head:

Mental Prominence _ tip of chin.

Sinciput _ brow _ junction of the anterior and superior aspects of the skull.

Bregma _ anterior fontanel.

Vertex _ region of the skull between the anterior and posterior fontanels.

Occiput _ junction of the posterior and inferior aspects of the skull _ the occipital protuberance being situated about the center of the occipital bone, and about 2.5 cm. (1 inch) behind the posterior fontanel.

Frontal Prominences _ centers of the frontal bones.

Parietal Protuberances _ centers of the parietal bones.

Diameters of the Fetal Head:

Bi-temporal – Bi-T. – widest distance between the lower ends of the coronary suture – 8 cm. ($3\frac{1}{8}$ inches).

Bi-parietal – Bi-P. – widest distance between the parietal eminences – 9.25 cm. ($3\frac{5}{8}$ inches).

Mento-occipital – M-O. – from the prominence of the chin to the most distant point upon the occipital bone – 13.50 cm. ($5\frac{1}{4}$ inches).

Fronto-mental – F-M. – from the summit of the forehead to the center of the prominence of the chin – 8.25 cm. ($3\frac{1}{4}$ inches).

Fronto-occipital – F-O. – from the glabella (midway between the superciliary ridges) to the most distantly projecting point of the occipital bone – 11.75 cm. ($4\frac{5}{8}$ inches).

Sincipito-occipital – S-O. – from the summit of the forehead to the external occipital protuberance – 11.50 cm. ($4\frac{1}{2}$ inches).

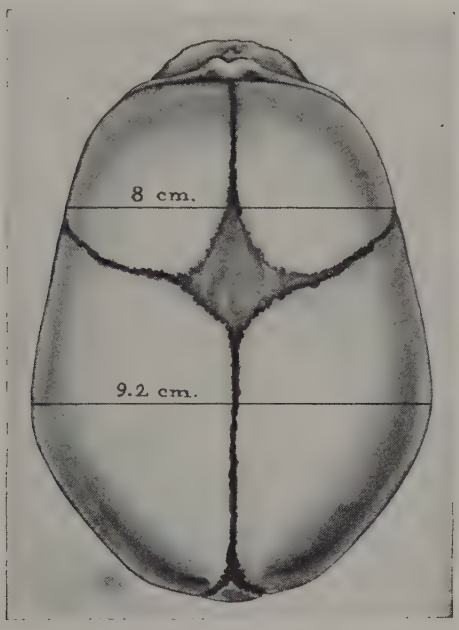


Fig. 6113.—Sutures, Fontanels, Landmarks, and Diameters of the Fetal Head – Seen from Above.

Cervico-bregmatic – C-B. – from the center of the anterior fontanel to the junction of the horizontal and vertical walls of the anterior aspect of the neck – 9.50 cm. ($3\frac{3}{4}$ inches).

Sub-occipito-bregmatic – S-O-B. – from the middle of the anterior fontanel to the under surface of the occipital bone, where it joins the nape of the neck – 9.50 cm. ($3\frac{3}{4}$ inches).

Planes of the Fetal Head:

Mento-occipital Plane – the largest – passes through the mento-occipital diameter – and has a circumference of 35 cm. ($13\frac{6}{8}$ inches).

Occipito-frontal Plane – passes through the occipiteo-frontal diameter – and has a circumference of 34 cm. ($13\frac{3}{8}$ inches).

Sub-occipito-frontal Plane – the smallest – passes through the sub-occipio-frontal diameter – and has a circumference of 32 cm. ($12\frac{5}{8}$ inches).

POSITION OF UTERUS AND CHILD AT THE END OF NORMAL PREGNANCY

The occupancy of the abdominal cavity by the gravid uterus at an advanced period of pregnancy is seen in Fig. 6114. The encroachment upon and displacement of the intra-abdominal viscera are well shown.

The contraction and recession of the structures immediately following labor is pictured in Fig. 6115.

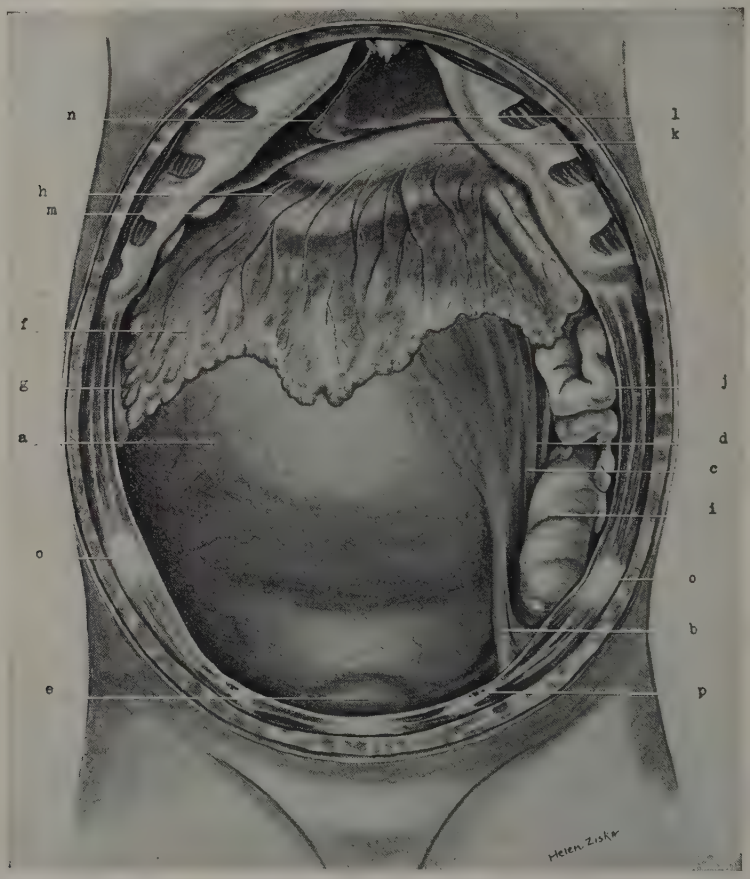


Fig. 6114.—Gravid Uterus of About Seven and a Half Months and Its Relations: – a, Uterus; – b, round ligament; – c, fallopian tube; – d, ovarian ligament; – e, bladder; – f, omentum; – g, ascending colon; – h, transverse colon; – i, sigmoid colon; – j, small intestine; – k, stomach; – l, liver; – m, gall-bladder; – n, suspensory ligament of liver; – o, o, anterior superior iliac spines; – p, p, epigastric vessels. (Modified from Couvelaire – from a dissection in the service of Champetier de Ribes.)

The position of the child in the utero-cervico-vaginal tract and the relations of the child, placenta, and uterus are illustrated in Fig. 6116.

THE STAGES OF LABOR

Preparatory:
First Stage – Uterine dilatation.
Second Stage – Fetal expulsion.
Third Stage – Placental expulsion and uterine contraction and retraction.

Fig. 6115.—Postpartum Uterus Immediately After Delivery—Showing the Relation of the Contracted Structures to the Surrounding Parts—as Compared with the Relations Shown During Occupancy of the Uterus, Seen in Fig. 6116:—**a**, Uterus; —**b**, bladder; —**c**, **c**, round ligaments; —**d**, fallopian tube; —**e**, ovary; —**f**, sigmoid colon displaced; —**g**, small intestine displaced; —**h**, aorta; —**i**, vena cava; —**j**, **j**, ureters. (Modified from Couvelaire—from a dissection in the service of Pinard.)

Fig. 6116.—Sagittal Section of Uterus at Full Term with Unsectioned Child Seen *In Situ*:—The child is presenting with its head in the right oblique diameter—intermediate between the anterior and transverse. The head lies in the vagina, with the *caput succedaneum* at the vaginal orifice. (Modified from Couvelaire—from dissection in the service of Champetier de Ribes.)

THE MECHANISM OF DELIVERY IN HEAD PRESENTATIONS

Delivery is usually described as accomplished, normally, in seven stages:

1. Molding and engagement.
2. Descent.
3. Flexion _ upon the transverse axis of the head.
4. Internal rotation _ on the vertical axis of the head.
5. Extension.
6. External rotation.
7. Expulsion.

THE USUAL PRESENTATIONS OF THE FETUS

By presentation, or position, is meant the part of the fetus which presents in the uterine, vaginal, or vulval tract. In another sense the designation is used in connection with the position which the long axis of the fetus bears with reference to the long axis of the mother _ as to whether the fetal presentation is longitudinal with it (as it is in over 99 per cent. of the cases) or transverse to it.

The following are the chief positions of the fetus: Vertex Presentations _ Face Presentations _ Brow Presentations _ Pelvic Presentations _ Shoulder presentations _ the occiput, chin, frontal bone, sacrum, and scapula serving, in order, as the contribution, on the part of the fetus, to the key, or pointer, of the special position.

The numerical order of the maternal sites or positions to which the fetal pointers are directed are the same in all of the sets of presentations _ the left iliopectineal eminence constituting the starting-point of the first position _ and, passing in order from left to right, first anteriorly and then posteriorly around the pelvis _ the right iliopectineal eminence marking the starting-point of the second position _ the right sacro-iliac synchondrosis marking the starting-point of the third position _ and the left sacro-iliac synchondrosis marking the starting-point of the fourth position.

The chief obstetric presentations, with the four possible positions of the fetus in each, are as follows:

(*a*) **Vertex Presentations** _ in which the occiput of the fetus occupies one of the following positions:

I. Left Occipito-anterior.
II. Right Occipito-anterior.
III. Right Occipito-posterior.
IV. Left Occipito-posterior.

(*b*) **Face Presentations** _ in which the chin or mentum of the fetus occupies one of the following positions:

I. Left Mento-anterior.
II. Right Mento-anterior.
III. Right. Mento-posterior.
IV. Left Mento-posterior.

(*c*) **Brow Presentations** _ in which the forehead or frontal bone of the fetus occupies one of the following positions:

I. Left Fronto-anterior.
II. Right Fronto-anterior.
III. Right Fronto-posterior.
IV. Left Fronto-posterior.

(*d*) **Pelvic Presentations** – in which the sacrum of the fetus occupies one of the following positions:

I. Left Sacro-anterior.
II. Right Sacro-anterior.
III. Right Sacro-posterior.
IV. Left Sacro-posterior.

(*e*) **Shoulder Presentations** – in which the scapula of the fetus occupies one of the following positions:

I. Left Scapulo-anterior
II. Right Scapulo-anterior.
III. Right Scapulo-posterior.
IV. Left Scapulo-posterior.

OBSTETRIC POSITIONS

Several radically different positions are assumed by the patient or instituted by the Obstetrician during the act of labor. Some of these are adopted

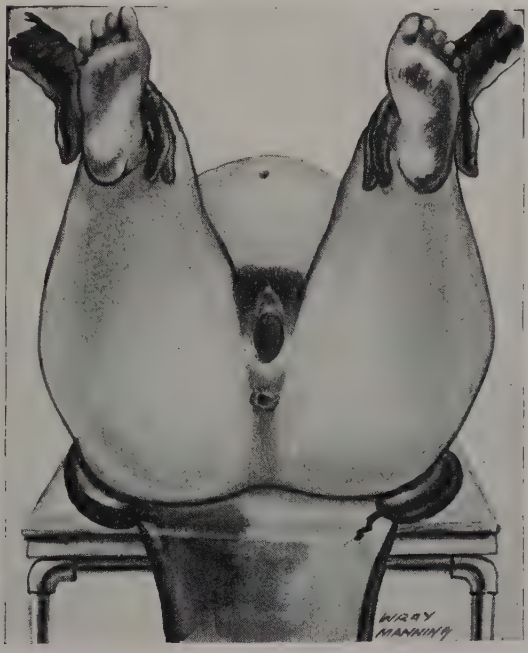


Fig. 6117.—Horizontal Dorsal Obstetric Position – upon a table.

by instinct on the part of the patient – or carried out as a matter of routine by the Attendant. Still others are temporarily employed – in the course of a normally or pathologically progressing labor – for the purpose of expediting delayed labor – retarding precipitate labor – or to modify certain resistances and forces for the accomplishment of specific ends, or to change the shape of the pelvis.

In addition to specific postures, and in accordance with the laws of gravity at large, lowering the pelvis favors the emptying of the uterus – and elevating the pelvis aids in retaining the uterine contents.

The postures most frequently assumed in delivery are here shown:

Horizontal Dorsal Position.—This is the most commonly employed position, assumed in America and on the Continent, of all obstetric postures. The patient may rest upon a special table, with her legs supported by two Nurses, against whom she counter-strains (Fig. 6117). Or she may lie in the cross-bed position – the Accoucheur sitting opposite her – or she may lie parallel with the edge of the bed, the Accoucheur sitting facing her. The method of supporting the perineum in the dorsal position is by the outstretched right palm, forefinger, and thumb.

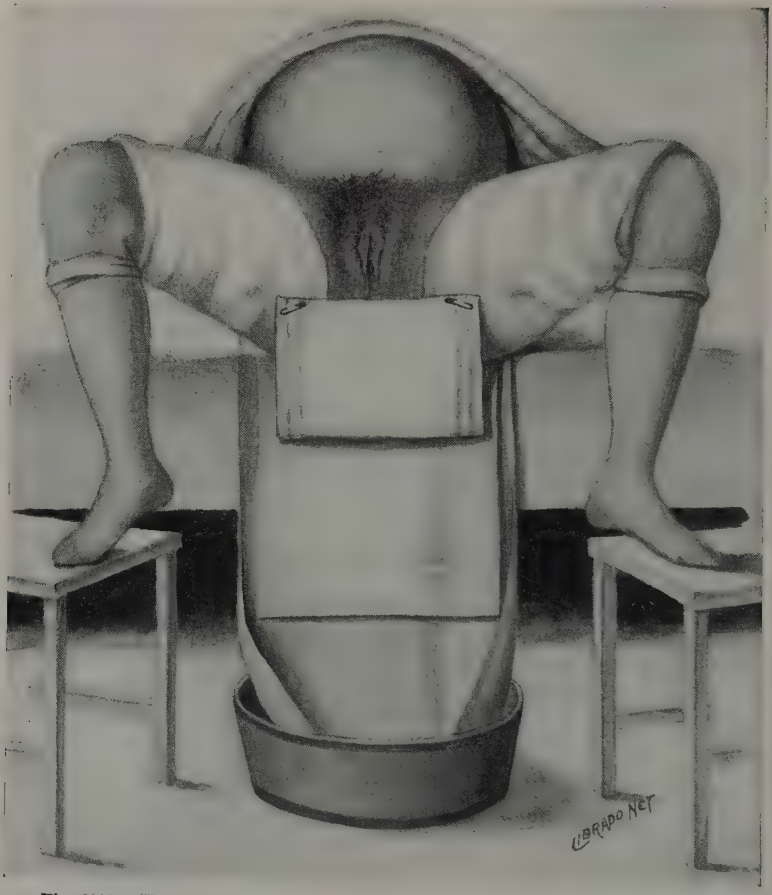


Fig. 6118.—Horizontal Dorsal Obstetric Position – in the cross-bed posture.

Left Lateral Position (Fig. 6119).—This is the posture assumed in England during the second stage. Its chief advantage is in the greater protection of the perineum – both because of its enabling the weight of the child's head to gravitate away from the perineum – and because of the additional bimanual support which it is made possible to render the parts – the perineum being *pushed* forward by the left hand, and the pressure of the head being *lifted* forward by the right hand, thereby reducing the distention of the perineum to the maximum. The Accoucheur sits or stands behind the patient's back, facing her feet – carrying his left hand between her thighs, from before back-

ward, with its palm to the child's head and with his right palm to the patient's perineum.

Fig. 6119.—Left Lateral Obstetric Position.

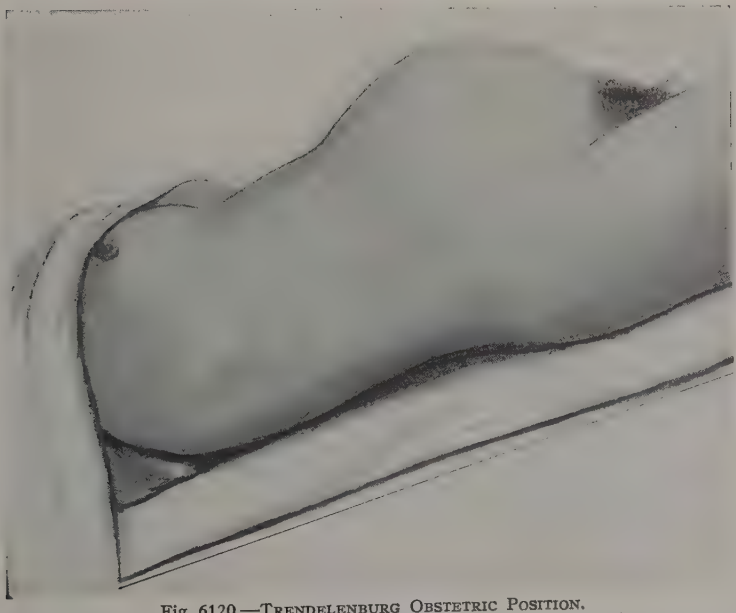


Fig. 6120.—Trendelenburg Obstetric Position.

Trendelenburg Position (Fig. 6120).—The patient is placed upon an inclined plane, head downward, and with hips elevated as much as indicated,

up to 45 degrees. It is adopted to elevate the pelvis, and thereby cause the contents of the pelvis to gravitate in the opposite direction. The posture can be better held than the following, which accomplishes the object more radically:

Fig. 6121.—Knee-chest Obstetric Position.

Knee-chest Position (Fig. 6121).—In this posture the pelvic inlet is placed upon a markedly lower plane than the pelvic outlet, but apart from the awkwardness and immodesty of the position, the physical hardship of

Fig. 6122.—Exaggerated Left Lateroprone Obstetric Position.

maintaining it usually renders it possible for only a short period, so that the same objective is often sought through either the Trendelenburg or the following posture.

Exaggerated Left Lateroprone Position (Fig. 6122).—This is often

employed to accomplish the same ends as the Trendelenburg or the knee-chest posture _ and is much more comfortable than the latter.

Walcher Position (Fig. 6123).—The object of this position _ which is just the reverse of the dorsal decubitus, with the thighs and legs in the lithotomy position (v. Fig. 6123) _ is to rotate the symphysis downward, thereby increasing the size of the pelvic inlet, especially its anteroposterior diameter. The patient rests her sacrum against the end of the table, and allows her thighs

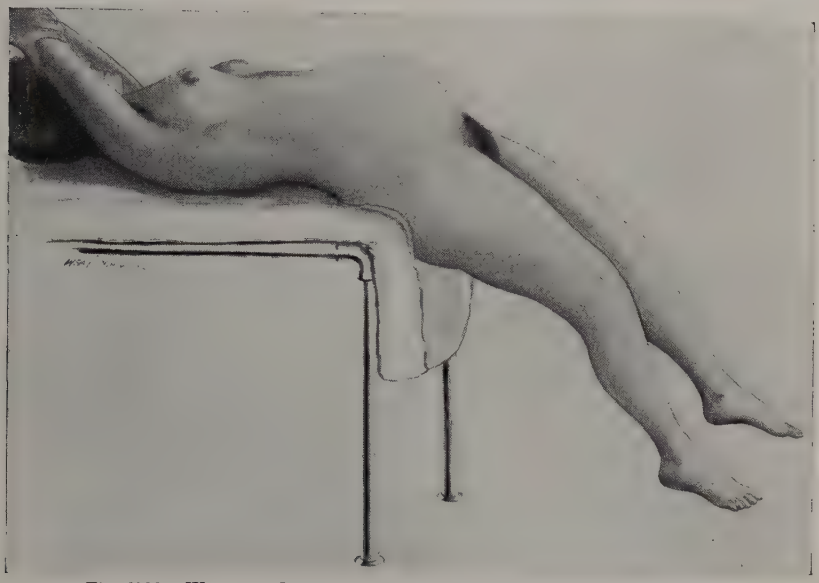


Fig. 6123.—Walcher Obstetric Position. The feet are usually unsupported.

and legs to hang downward unsupported (the toes sometimes merely rest against the edge of a stool).

METHODS OF ARTIFICIALLY PRODUCING ABORTION AND PREMATURE LABOR

Definitions.—Artificial abortion is the artificial (usually instrumental) emptying of the uterus before the child is viable _ that is, at any period within the termination of the first seven months. Early abortion is said to be performed when pregnancy is terminated at any period from the beginning of the first to the ending of the third month (or, according to some, the fourth month) _ up to which time the conceived product usually comes away *en masse*. Late abortion is brought about when the uterus is emptied at any time between the beginning of the fourth and the end of the seventh month _ within which period the phenomena of labor are more nearly simulated.

Artificially produced premature labor is applied to delivery artificially (usually instrumentally) brought about at any period between the end of the seventh month (end of the twenty-eighth week), when the child is viable _ and the end of normal pregnancy, at the end of the ninth month.

Indications.—(*a*) General Maternal Indications: uncontrollable vomiting of pregnancy _ marked nephritis _ eclampsia _ marked cardiac and pulmonary disease _ insanity and chorea of pregnancy _ pernicious anemia and leukocythemia _ toxemia of pregnancy. (*b*) Local Maternal Indications: infection following attempts at criminal abortion _ placenta prævia, or other

persistent uterine hemorrhage – obstructing tumors – marked uterine displacement resulting in irreducible incarceration – extreme pelvic deformity – hernia – marked deformity of the soft parts. (*c*) Fetal Indications hydatidiform mole – hydramnios – death of the fetus.

The methods of emptying the pregnant uterus are, naturally, somewhat modified in accordance with the period of advancement which the pregnancy has reached – as to whether an early abortion – late abortion – or premature labor be planned. While measures for emptying the uterus within the first month of pregnancy may equally as efficiently empty the nine-month uterus – and *vice versa* – yet some methods are more appropriate, in a general way, at one stage than at another. Further, as some of the methods for causing premature delivery are practically the same as those for artificially dilating the cervical canal in labor at full term, these will be merely mentioned here – and separately described in detail under the Manual Dilatation of the Cervix (v. p. 723) and the Instrumental Dilatation of the Cervix (v. p. 721).

Fig. 6124.—Production of Abortion by Gradual Dilatation of the Cervix, Followed by Packing of the Cervical Canal and Vagina with Gauze.

The most generally employed instrumental methods of producing abortion and premature labor are the following (the most careful technical preparation and aseptic conduction of procedure being presupposed):

Production of Abortion, by Gradual Dilatation of the Cervix, Followed by Packing of the Cervical Canal and Vagina with Gauze.—This may be regarded, all in all, as the best and safest method of emptying the uterus – under average circumstances – and when the element of haste is not a consideration. The procedure is conducted – as are all the various allied procedures – under anesthesia and with all the surroundings of asepticism. A weighted posterior vaginal specimen is usually employed. The cervix is grasped with vulsellum forceps and drawn downward. Beginning with the smaller sizes the cervix is gradually dilated with Hegar's dilators or others of a similar nature. The earlier the pregnancy, the more patient and gradual must be the dilatation. This dilatation is only carried far enough to enable a narrow

strip of hemmed, selvedged aseptic gauze to be carried into the cervical canal. No wide stretching of the cervix is sought – nor is it intended to carry the gauze high up into the uterine cavity in this special technic. The gauze is packed rather tightly into the cervical canal either by means of a curved uterine dressing forceps – or through a uterine packing cannula. When the cervical canal has been tightly packed, the succeeding strips of gauze are snugly packed into the vaginal cavity until it is distended – which considerably adds to the efficiency of the technic. The packed cervicovaginal cavities are seen in Fig. 6124. The vaginal packing holds the cervical packing in place – and the vaginal packing is, in turn, held in place by the application of a moderately tight T-bandage. These are kept in position for about twelve or eighteen hours. Upon their removal the cervix is usally found sufficiently dilated to enable the finger to be introduced into the uterine cavity – which

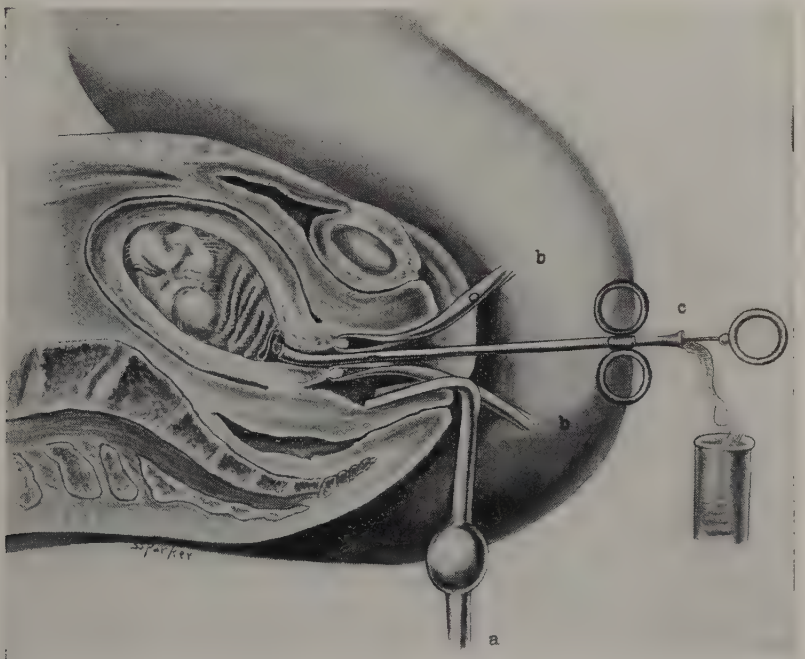


Fig. 6125.—Production of Abortion by Gradual Dilatation of the Cervix and Packing of the Uterine Cavity.

is the best final method of removing the entire uterine contents when it can be accomplished – and the best method, in addition, of convincing one's self that the entire products of conception have been removed.

In the earlier months it may be necessary to remove the contents by uterine placental forceps (of a small type) – or by blunt curet – followed, in addition, by curetage most carefully conducted – and, finally, by douching with saline solution.

Sometimes it will happen that the product of conception cannot be reached, or, if reached, removed by the finger after the dilation of the cervical canal. In such instances one may elect to repeat the packing – this time including, as in the following technic, the packing of the uterine cavity in addition.

Production of Abortion by Gradual Dilatation of the Cervix and Packing of the Uterine Cavity.—The preliminary cervical dilatation is

accomplished as in the method just described — the stretching being carried on sufficiently to admit the passage of the cannula or the hollow uterine packer — which is then introduced through the canal into the lower part of the uterine cavity. Through this strips of gauze are carefully packed into the cavity of the uterus already partly occupied by fetus, placenta, and membranes (Fig. 6125). This packing must necessarily be carried on largely without method as to the delivery of the gauze strips — but it is sought, in a general way, to carry these between the uterine wall and the membranes — the membranes tending to be thereby separated from the wall of the uterus without rupture. The vagina is also packed. The conception products and intra-uterine gauze are usually expelled into the vagina in from twelve to eighteen hours.

Fig. 6126.—Production of Abortion by Slow or Rapid Dilatation of the Cervix, Followed by the Digital Removal of the Products of Conception.

Production of Abortion by Rapid Dilatation of the Cervix, Followed by the Digital or Instrumental Removal of the Products of Conception.—While the rapid dilation of the cervix to empty the uterus in the early stages of pregnancy is condemned by the majority of Surgeons, as the cervix is thereby frequently badly torn, and the shock is considerable, it is, nevertheless, frequently practised. The posterior vaginal wall is retracted by a weighted speculum — the cervix brought down by vulsellum forceps — and at once dilated by successive dilators of the Hegar type or by a branched dilator of the Goodell type — until the cervical canal can take the index-finger. The Surgeon then carries his lubricated gloved hand into the vagina if possible — and his right index-finger through the cervical canal up into the uterus — while his left hand depresses the fundus of the uterus through the abdominal wall

– the patient being in the exaggerated lithotomy position. He seeks to insinuate this finger between the placenta and the uterine wall – and to separate the mass intact (Fig. 6126) – and bring it away. Sometimes the products cannot be sufficiently reached by the finger – requiring that the finger be replaced by a blunt curet (Fig. 6127). It is desirable to remove the mass intact – and without the aid of uterine forceps or curet – and especially without the latter (unless dull). But it will sometimes happen that the products can only be removed after being broken up – and even then only with difficulty.

The majority of Surgeons curet, with sharp curet, the uterine surface after removing the products of conception – and especially if these have been broken up in the act of removal – following the curetage by a sterile (sometimes antiseptic) douche – and sometimes by gauze packing of the uterine cavity temporarily – though many omit the packing. Others avoid the curet-

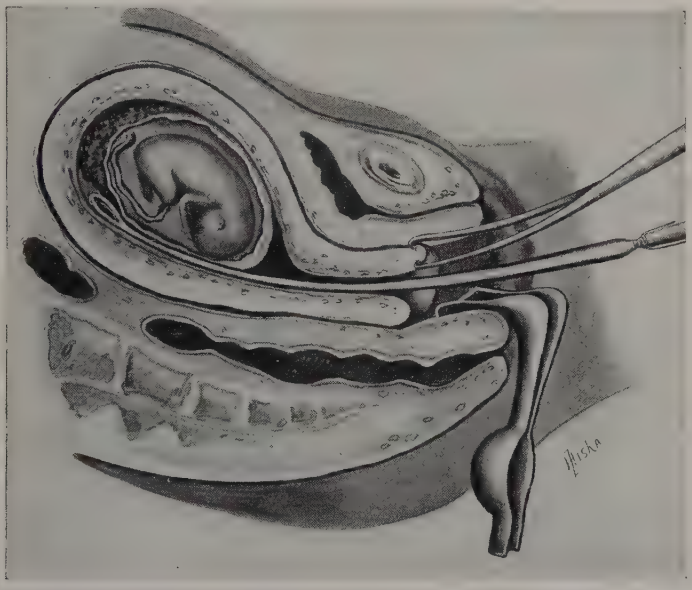


Fig. 6127.—Production of Abortion by Slow or Rapid Dilatation of the Cervix, Followed by the Instrumental Removal of the Products of Conception.

ment – especially if the removal be clean and the removal of the products be accomplished intact.

Production of Abortion by Instrumental Rupture of the Membranes.—The cervix is brought into the field as in the preceding method – in the manner common to all of these allied operations. The instrument employed is usually a uterine sound, which is guided through the cervical canal – and then, by a controlled stab or steady push, carried through the membranes – but with such guarded care as to avoid any chance of penetrating the uterine wall – which has been inadvertently done in some cases of unrecognized uterine displacement. It is well to have a sound with rather a small tip – as one is aware how hard it often is to penetrate even the bulging membranes at full term. The object is to let the amniotic fluid drain away – the evacuation of which is usually followed by uterine contractions and the expulsion of the uterine contents. The technic is shown in Fig. 6128. The method is not

always successful _ and may have to be reinforced by some of the other methods described. This principle is applied in the criminal use of bodkins and the like.

Production of Abortion by the Passage of a Soft Solid Sound or Catheter with Stilet Between the Membranes and the Uterine Wall _ Krause. —The cervix is brought within reach by tenaculum or vulsellum forceps _ and, guided by combined sight and touch, a soft solid bougie of about No. 12, American scale, is carried through the cervical canal _ and is then carefully pushed on upward toward the fundus of the uterus, between the membranes and the uterine wall _ traveling in the direction of least resistance _ aimed to avoid the placenta (Fig. 6129). If resistance be encountered, or blood appears at the cervix, the bougie is partly withdrawn, and its course slightly changed _ or it is withdrawn and introduced in another quadrant. Sometimes an additional bougie is introduced. Gauze is then packed into the vagina. Delivery

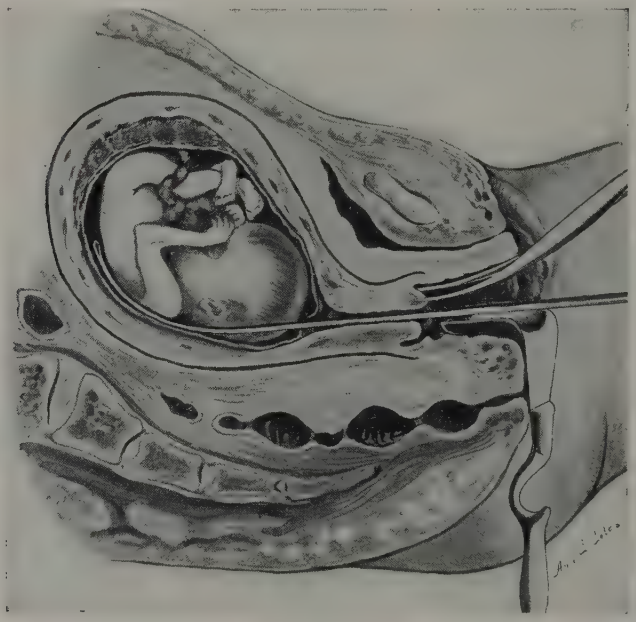


Fig. 6128.—Production of Abortion by Instrumental Rupture of the Membranes.

of the uterine contents usually begins within twenty-four hours. On the other hand, the result is sometimes negative _ and the original bougie has to be withdrawn, the vagina douched, and one or more new ones introduced.

Production of Abortion by Vaginal Packing.—The tight and systematic packing of the vagina with strips of sterile gauze will often result in the throwing off of the contents of the pregnant uterus within twenty-four or forty-eight hours. The method finds its chief application in cases of bleeding from the pregnant uterus _ in cases other than those of placenta prævia _ where the twofold object is accomplished of controlling hemorrhage and expediting the emptying, which is usally inevitable after bleeding begins. No single vaginal packing should be allowed to remain *in situ* for more than twenty-four hours at the outside, as it becomes very foul. It should be then removed _ the vagina douched antiseptically _ and a new packing made.

Production of Abortion by the Gradual Dilatation of the Cervical Canal with Laminaria Tents.—This is one of the simplest and oldest methods _ once greatly in vogue, until largely discarded because of frequent sepsis consequent upon the technic _ which latter feature should be now almost entirely eliminatable through modern-day asepticism. The technic has been described and illustrated on pp. 233–240, in connection with the dilatation of the cervical canal for operative purposes. The method is the same in principle as the production of abortion through the dilation of the cervical canal by gauze packing already described (v. p. 712). One or more of the laminaria tents are introduced into the cervical canal under the greatest precautions against sepsis and guaze packed into the vagina. In from twelve to twenty-four hours the gauze and tents are removed _ when the cervix will be found to be softer and more patulous _ and can then usually be sufficiently further dilated by a finger, or by the Hegar dilators _ after which the indicated technic for the removal of the products of conception is carried out.

Fig. 6129.—Production of Abortion by the Passage of a Soft, Solid Sound or Hollow Soft Catheter, with Stilet, Between the Membranes and the Uterine Wall.

Production of Abortion by Means of Dilatation Accomplished by the Fingers, by Branched Steel Dilators, and by Inflatable Rubber Bags.—All of these measures are sometimes employed in the artificial production of abortion _ but are procedures better adapted to the artificial production of premature labor _ in connection with which they will be described.

Production of Premature Labor, by Digital and by Instrumental Dilatation of the Uterocervical Canal.—See the separate treatment of this subject in the following section.

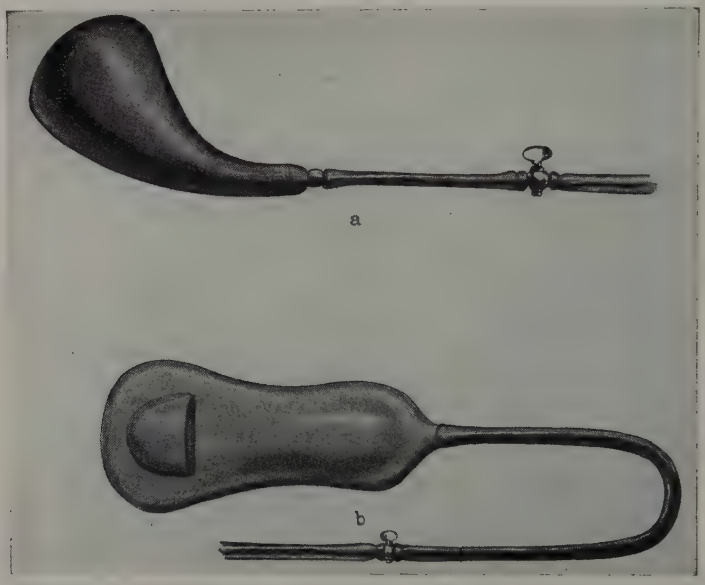
METHODS OF ARTIFICIALLY PRODUCING PREMATURE LABOR _ AND OF DILATING THE UTEROCERVICAL CANAL IN FULL-TERM DELIVERY

Definition.—The artificial production of premature labor is the production artificially _ usually by instrumental or digital means _ of the emptying of the pregnant uterus at any time between the age of viability, seven months, and the normal termination of the full term, at nine months.

The same measures which are employed to produce early or late abortion (v. pp. 711–717) are, of course, also capable of emptying the uterus at any period beyond the seventh month as well.

And, additionally, the same measures which are about to be described for the production of premature labor are also often employed for the purpose of further dilating the insufficiently dilated cervix in labor at full term.

To summarize, the conditions dealt with in this category of procedures, including those already described and those about to be described, are the following: the production of abortion (either early, in the earlier half of the first seven months, or late, in the latter half of the first seven months) – the production of premature labor in the eighth and ninth months – and the artificial dilatation of the uterocervical canal at full-term delivery at the end of the ninth month. And the means to these ends are – either those already mentioned under the subject of the artificial production of abortion and of pre-



Figs. 6130 and 6131.—Forms of Uterocervical Dilating Bags: – a, Bag of Champetier de Ribes; – b, Barnes' bag.

mature labor – or those about to be given under the production of premature labor, and the artificial dilatation of the uterocervical canal at full-term labor – recognizing the applicability of either class of measures to either class of conditions – through the greater appropriateness of some measures for each set of conditions than for others.

The methods most frequently employed for the production of premature labor – other than those mentioned under the Production of Abortion (v. pp. 711–717) – are the rapid dilatation of the uterocervical canal by means of rubber bags distended with water or air – and by means of branched dilators. Before either of these measures can be used a closed os must be partially dilated to admit them.

The most generally used methods of aiding in the dilatation of the uterocervical canal at full-term delivery are the following: rapid dilatation by means of rubber bags, distended by water, or less desirably by air – rapid dilatation by branched dilators – rapid manual dilatation – and surgical

section of the unyielding external os. As these measures are applied during the progress of early labor some degree of patulousness of the cervical tract is usually present _ in contrast with the condition encountered in producing premature labor.

Instrumental Dilatation of the Uterocervical Canal by Means of Rubber Bags Distended with Water _ for the Artificial Production of Premature Labor _ and for Aiding in the Dilatation of the Canal at Full-term Delivery.—The forms of rubber bag most frequently employed for this purpose are the balloon-shaped bag of Champetier de Ribes (Fig. 6130, **a**) _ or the saddle-bag-shaped bag of Barnes (Fig. 6131, **b**) _ or some modification of these, such as Steele's or Voorhees' (Fig. 6132). These as suggested by their size, are not capable of being introduced unless some degree of dilatation of the cervical canal has been attained. In the early stage of labor a certain degree of dilatation is usually found. In producing premature delivery

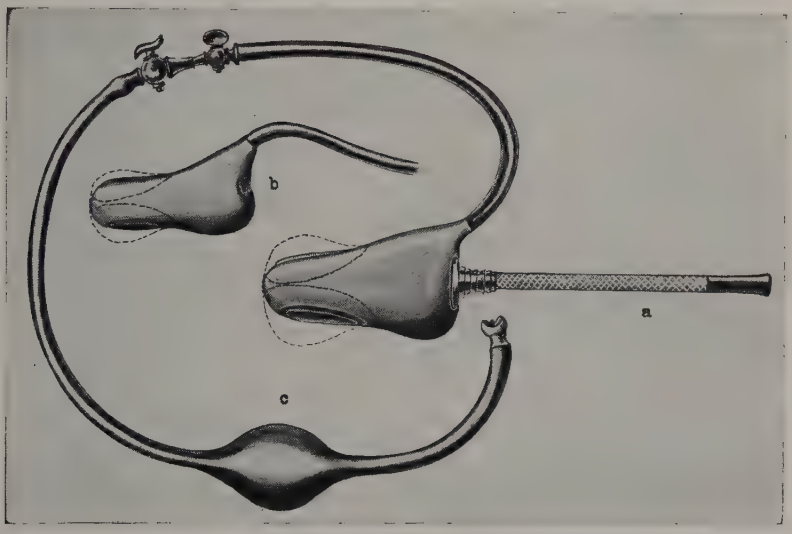


Fig. 6132.—Steele's Modification of Barnes' Cervico-uterine Dilating Bag _ made in three sizes; _ the distal end of the bag is collapsible, above and below, assuming the dotted outline on distention _ the smallest distended diameter being grasped by the internal os: a, Detachable introducer; _ b, site of insertion of introducer; _ c, rubber bulb syringe for filling the bag with fluid. (Modified from Allen and Handbury, London.)

the initial dilatation, to prepare room for the introduction of the bag, is generally secured through some such form of preceding dilatation, rapid or slow, as mentioned among the means given for producing abortion. The bags are generally made in three sizes _ small, intermediate, and large. The distention is usually accomplished through fluid (generally either plain sterile solution, or 1 per cent. lysol solution). The empty bag is sterilized _ and then folded upon itself lengthwise, into as small a form as possible. This, lubricated, is seized with special introducing forceps or long uterine dressing forceps, and carried through the cervical canal until a sufficient extent of the constricted portion of the bag is carried above the internal os to enable it to be held by the os (Fig. 6133). The bag must pass far enough into the lower uterine cavity to be held _ but not carried too far, for it is capable under such circumstances of changing the presentation of the child. As soon as the bag is satisfactorily in position, a Davidson hand-bulb syringe is attached to the filling tube,

and the bag is slowly distended with fluid (Figs. 6134 and 6135). It is often difficult to place the bag and have it held in position – especially if the cervical

Fig. 6133.—Introducing Champetier de Ribes' Hydrostatic Cervical Dilator Folded – by means of de Ribes' introducing forceps.

canal be shallow. A small bag is generally first used – after which the initial amount of fluid thrown into it is gradually increased – or the next larger bag

Fig. 6134.—Distention of de Ribes' Uterocervical Dilator – filled with air or fluid.

used, and similarly manipulated. Fluid rather than air should be employed – and it is to be remembered that uteri have been ruptured by both water-

distended and air-distended bags – and that sudden rupture of the bag itself, even though the uterus be not ruptured, may be serious – though is less apt to be so when the distending agent is fluid. All bags should be tested in advance – and, after measuring the amount of fluid to be thrown in, a little less should be pumped in after the bag is in the cervico-uterine canal than was used in making the special test of that bag. The bag is introduced with the pateint either in the dorsal or in Sims' position. If the diameter of the cervical canal is as much as 1.5 cm. (9/16 inch), this will usually suffice for the introduction of the bag – and, if not, must first be brought up to that measurement by preliminary dilatation by means of a Goodell or other form of dilator. The bag is sometimes introduced and distended under anesthesia. It usually remains *in situ* several hours – and is generally spontaneously expelled – after which labor either completes itself – or is completed artificially – or a larger bag is introduced. If speedier action of the distending bag is sought, a weight

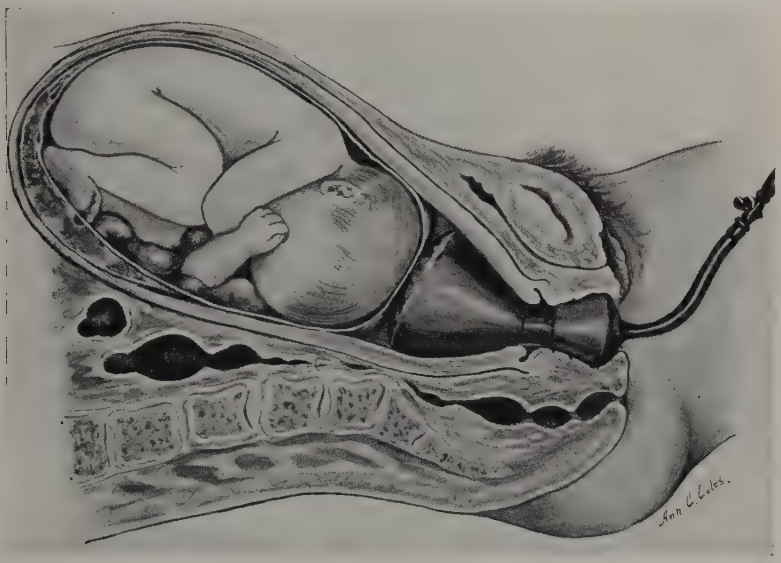


Fig. 6135.—Distention of the Uterocervical Canal – by means of Coe's modification of de Ribes-hydrostatic cervical dilator filled with fluid.

(about 2 pounds) may be attached to the rubber inlet tube, and dropped over the edge of bed or table, which will tend to draw the larger diameter of the bag through the constricting portion of the uterocervical canal. The bladder should always be emptied before the bag is introduced. It is sometimes an aid, in placing the bag, to infold its empty fundus before longitudinally folding it in the grip of the introducing forceps. The bag often requires twelve hours for its expulsion. The vulvæ are aseptically protected during its retention.

Rapid Instrumental Dilatation of the Uterocervical Canal by Means of Branched Dilators – for the Artificial Production of Premature Labor – and for Aiding in the Dilatation of the Canal at Full-term Delivery.—Several forms of double-bladed, triple-bladed, and quadruple-bladed dilators are in use – of which the best form is considered to be the Bossi four-bladed cervico-uterine dilator (Fig. 6136) – or some of its modifications. All of these instruments must be used with extreme care, as they are potential

of much harm – extensive and serious lacerations have been caused by them – and it is to be understood that none of them enable the cervico-uterine passage

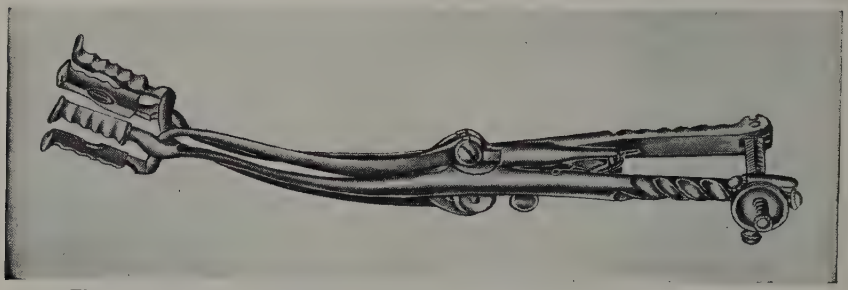


Fig. 6136.—Marelli's Modification of Bossi's Four-bladed Uterine Dilator

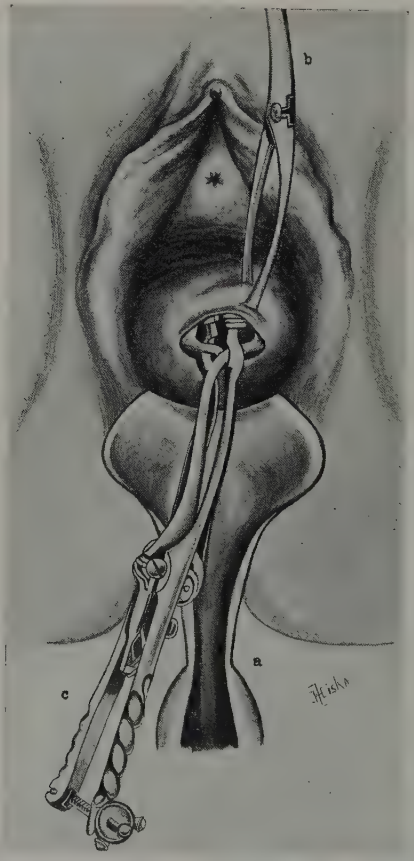


Fig. 6137.—Rapid Instrumental Dilatation of the Cervix Uteri by Means of the Ross Type of Four-bladed Dilator: – a, Self-retaining posterior vaginal speculum; – b, vulsellum steadying and drawing the cervix forward; – c, Marelli's modification of Bossi's uterine dilator in the act of distending the cervico-uterine canal by the gradual separation of its four blades.

to be as safely dilated as can be accomplished by the rubber bags and by the fingers. Much that has been said concerning the preparation for using the

rubber bag dilators applies to the use of expansible metallic dilators (q. v.). Strictest asepticism is employed, and the technic is carried out under anesthesia, as the shock is considerable. The preliminary natural, or instrumental partial dilatation of the cervix is taken for granted, up, at least, to the extent of enabling the instrument to be passed. If this degree of opening is not present, it is usually secured with a Goodell dilator. The use of the instrument is often difficult, and is generally considered to be contraindicated, until after the cervix has been obliterated. The flanges of the blades must pass beyond the internal os. While the os may be steadied by vulsellum forceps while the blades are being started into position, and is sometimes held throughout the dilatation, as shown in Fig. 6137, others soon relax the hold of the os,if it have been taken, so as to avoid the difficulty of introducing the blades which is sometimes experienced when the cervix is elongated by traction upon it. When all is in readiness and the instrument satisfactorily placed, the dilatation is slowly begun, and evenly and, slowly carried on throughout never

Fig. 6138.—Unimanual Dilatation of the Cervico-uterine Canal, by the Marris method. I;, The lubricated, gloved hand has been carried into the vagina, and first one finger and then two into the uterine cavity.

increasing the dilatation except in the interval between pains, and sometimes even reversing the screw, and examining, with the finger, the condition of the inner and outer aspects of the cervical wall, between the blades, during the expansion. The time required for dilatation will differ, according to the condition of the cervix, usually extending from twenty to forty minutes. The more cautious cease dilating when 6 cm. ($2\frac{6}{16}$ inches), about the middle of the scale, have been reached, though others continue until 10 cm. have been attained. The instrument is then slowly unscrewed, and withdrawn.

Manual Dilatation of the Cervico-uterine Canal in the Artificial Production of Premature Labor, and in Aiding the Dilatation of the Cervico-uterine Canal in Labor at Full Term.—The manual dilatation of the cervico-uterine canal is more fatiguing than are other methods, usually consuming from thirty minutes to an hour in multiparæ at term, and often one and one-half hours in primiparæ, but is distinctly less likely to do damage to the structures than are the steel dilators, being more nearly akin to the

rubber-bag dilatation. The use of manual dilatation presupposes a patulousness of the cervical canal sufficient to admit of the passage of a finger – and

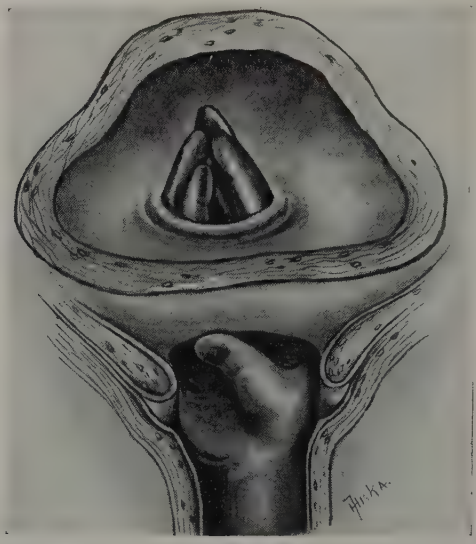


Fig. 6139.—The Same – II; – Four fingers have been finally worked into the uterus.

Fig. 6140.—III; – The whole hand has, at last, been carried through the cervico-uterine opening into the uterine cavity.

if this cannot be accomplished by the gradual passage of smaller and then larger fingers, as usually can be accomplished in delivery at full term, then instrumental or other dilatation of the canal up to finger size must first be

brought about – whereas, in dilating to produce premature labor, the dilation of the cervix, preliminary to the use of the fingers, must usually be accomplished by such measures as gauze packing, tents, the Goodell dilator, and the like. Manual dilatation to produce premature delivery, in the latter months, when the os is firmly closed, is often difficult, and less effective than other methods. Its especial field is in labor at full term. No attempt should ever be made to manually dilate a cervical canal which is still present in anything like its full length. The condition of the parts is under direct digital verification throughout. The bladder and rectum should be entirely emptied. Rubber gloves are worn – and the parts thoroughly prepared – and strict

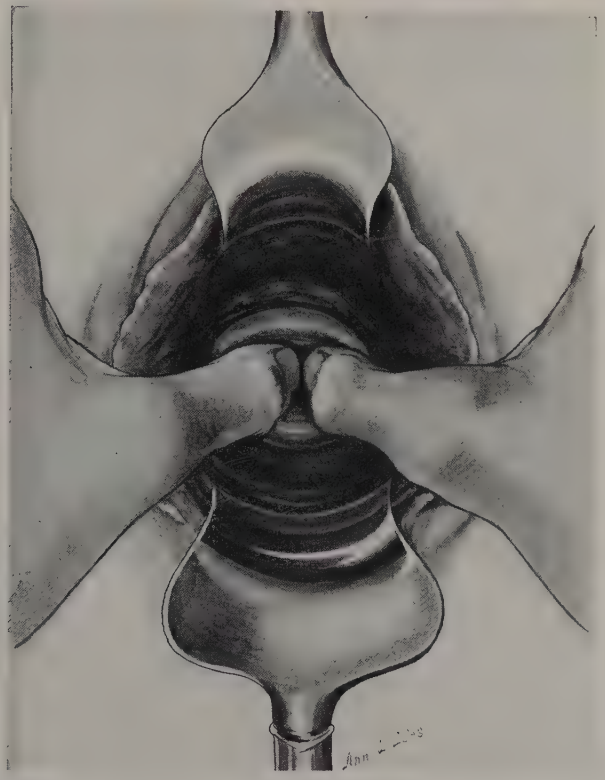


Fig. 6141.—Bimanual Dilatation of the Cervico-uterine Canal – I; – The two thumbs, carried into the cervical canal, are practising traction lateralward – while the fingers are braced against the trochanters as "points d'appui"

asepticism maintained. The patient is anesthetized. Dilatation is only practised in the interval between pains. Two methods of manual dilatation have been systematized:

(*a*) Unimanual Dilatation of the Cervico-uterine Canal – the Marris method (Figs. 6138–6140): One gloved hand is here alone used. The uterus is steadied and depressed by a hand upon the abdominal wall over the fundus. The patient usually lies upon her back. The lubricated hand is carefully carried into the vagina – and the index-finger into the cervical canal – and slowly on into the uterus. After gentle massaging of the cervical wall, or the lower uterine segment, if the cervix, as such, has been already taken up, between the finger within and the thumb without, the first finger is with-

drawn _ and either the first and second fingers introduced, or the first finger and thumb. By a gradual process of careful and controlled boring and massaging all of the fingers are finally introduced through the cervical canal into the uterine cavity _ and by the systematic and rythmical lateral separating of the fingers the cervico-uterine canal will be entirely dilated _ sufficiently for the hand to enter _ and usually sufficiently for the extraction of an average child under average conditions. The various maneuvers are suggested in the accompanying illustrations. It is objectionable to have to introduce the entire hand into the vagina to practice this technic _ and usually im-

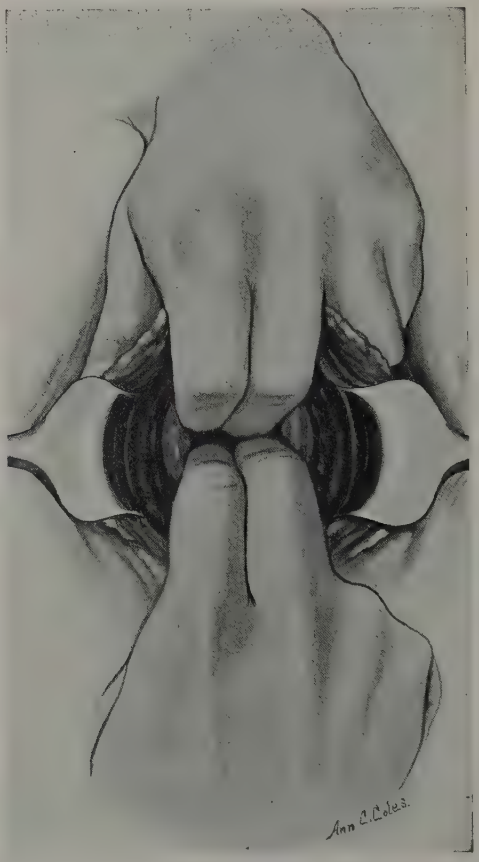


Fig. 6142.—The Same _ II; _ The first two fingers of each hand have replaced the thumbs _ and practice traction, first upward and downward, as here shown _ and then lateralward.

possible in the case of a large hand and a primiparous vagina. A compromise measure is sometimes practised _ of inserting one finger into the uterus and, by hooking this, bring down the organ, combined with outward pressure over the fundus, until the fingers can be utilized without introducing the entire hand into the vagina.

(*b*) Bimanual Dilatation of the Cervico-uterine Canal _ the Bonnaire Method (Figs. 6141 and 6142).—All of the preliminaries are the same in this method as in the preceding one. The hand does not enter the vagina. More force is capable of being applied in the counterpull of the fingers than in

the simple separation of the fingers in the preceding technic – and, for that reason, the opposite pulls must not be too suddenly or strongly employed. The dilatation is usually begun by carrying the first fingers into the cervico-uterine canal, already partly dilated, either by natural or instrumental means – and practising traction in opposite directions – often swinging the hooked fingers through opposite half-circles. When these have further dilated the canal, the two thumbs are entered, nail to nail, and, in turn, practice traction either towards the two sides, while the fingers of the hands are braced against the trochanters – or upward and downward, while the fingers are braced over the symphysis and sacrum. When this additional distention has been secured

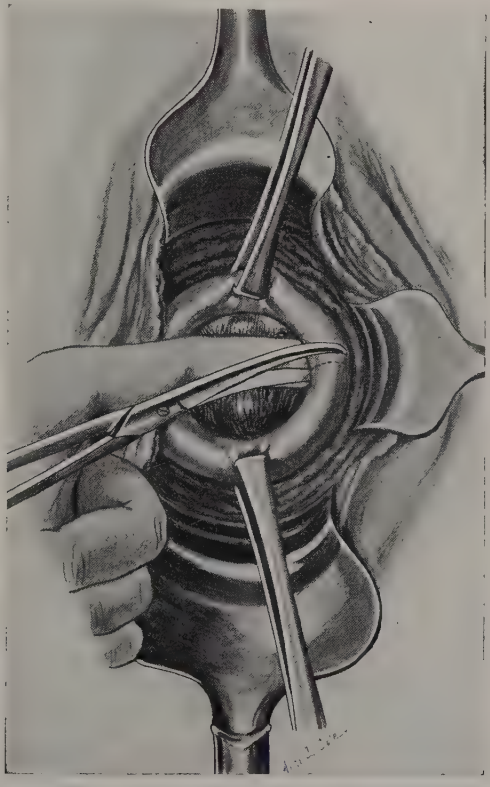


Fig. 6143.—Section of the Rigid or Undilated Cervix to Promote Dilatation at the Time of Labor; – Bilateral division of the cervix is being made by scissors under guidance of the finger.

the first and second fingers of each hand are made to replace the thumbs – and with these the dilatation is finally completed – until delivery can be left, henceforward, to nature – or until the entire hand or forceps can be carried into the uterine cavity and the child delivered.

Section of the Rigid or Undilated Cervix to Promote Dilatation at the Time of Labor.—The division of the cervix is but rarely called for – and its performance is not devoid of danger. The chief danger lies in the possibility that the incision or incisions made at first limitedly, may, under the distention of the on-coming child, be converted into considerable lacerations of the cervico-uterine junction, or even of the body of the uterus. Hemorrhage may occur from the incisions themselves – and especially from the lacerations

into which the original tears may split. Rigidity of the cervix, especially occurring in child-bearing late in life, or after an interval of many years – or the presence of a large amount of cervical scar tissue – are the conditions most frequently present.

Section of the cervical tissue is made in one of two ways – either by a number of superficial nicks of the cervical margins – or by one or two deeper cuts entirely through the wall of the cervix. The latter is the better method. Two such cuts are usually made. If placed at the lateral junction of the lips, more hemorrhage is apt to occur than if placed in the median line of the anterior and posterior lips. The incisions are best made by means of stout, round-pointed scissors – guided by a finger just within the os and during a moderate pain (contraction) – in the manner shown in Fig. 6143. The technic may sometimes be aided by seizing the cervical lips with vulsellum forceps and steadying them in the field, against their tendency to slip backward as the blades of the scissors are closed – thereby resulting in insufficient section of the cervical wall. Duehrssen carried the incision to the uterovaginal junction.

The vaginal wall should be pushed upward before making the incisions – as there is danger in anterior and posterior incisions of cutting the bladder, or into Douglas' culdesac – or, laterally, of cutting the ureters – unless the sections be made carefully. Sometimes four of the deeper cuts are made in opposite pairs.

These sections should not be made until after the supravaginal portion of the cervix has been taken up in the general dilatation – and when made should only involve the vaginal portion of the cervix – and should not be practised at all when the conditions of presentation be such that the incised structure will be subjected to unusual tension during the expulsion or extraction of the on-coming child.

It is often said that the wounds resulting from these cervical sections do not require to be repaired at the end of labor – but this is certainly not the case of the deeper sections.

MANUAL, INSTRUMENTAL, AND OPERATIVE DILATATION OF THE VULVOVAGINAL OUTLET AT THE TIME OF LABOR OR PREMATURE DELIVERY

Dilatation of the vulvovaginal outlet is sometimes called for – especially in primiparæ, in very young and old ages, at the time of labor at normal term – and sometimes in this type of cases as well as others in the production of premature labor. The technic is even more apt to be called for where cicatricial or pathologic conditions have contracted the vulvovaginal outlet. The enlargement of the opening is accomplishable by several means:

Manual Dilatation of the Vulvovaginal Outlet: The initial step toward dilation by hand is usually accomplished by forming a tapering cone of the lubricated gloved fingers of the right hand – and, while the vulvovaginal lips are well separated by the fingers of the left hand, the fingers of the right hand, in the form of a tapering cone, are gradually carried into the vagina – by a combined motion of rotation, boring, and advancement – until the knuckles – and then possibly the whole hand – enter – as shown in Fig. 6144.

When manual dilatation is applied later on – when the head is well down and engaged, and the rim of the vulvovaginal outlet seems to be exercisng retardation upon the progress of labor – dilation may also be indicated – and at this stage is best accomplished by using the thumbs and fingers of opposite hands as lateral tractors of the boundaries of the outlet over the convexity of the advancing part – in the manner shown in Fig. 6145.

Instrumental Dilatation of the Vulvovaginal Outlet by Means of Distend-

ing Rubber Bags: A rubber bag of, for instance, the Barnes' type is utilized upon the same general mechanical principle as when employed for dilating the cervix (v. p. 719) – except that it is here carried only far enough within the vagina for its constricted portion to be gripped by the narrowest part of the outlet – the portion which is offering the greatest resistance to the presenting part. The bag is then gradually distended with water – and possibly a larger size inserted later. The use of this technic is only possible, of course, when there is enough room for the bag to be accommodated and gripped between the presenting part of the child and the outlet of the vulvovaginal passage.

Fig. 6144.—Initial Stage of the Manual Dilatation of the Vulvovaginal Outlet – before any marked distention of the parts has occurred.

Operative Dilatation of the Vulvovaginal Outlet – by Section and Subsequent Repair of the Vaginal Margin – Vaginoperineotomy Followed by Vaginoperineorrhaphy: This technic has been sometims less correctly designated episiotomy, which more literally means section of the pubis. As more of the incision may involve the vagina, the technic partakes of the feature of vaginotomy – and as, on the contrary, the perineotomy feature may predominate when the section chief divides the adjacent perineum. It usually, however, combines both features – and about equally. Several laterally placed superficial incisions may be made guardedly by knife (remembering

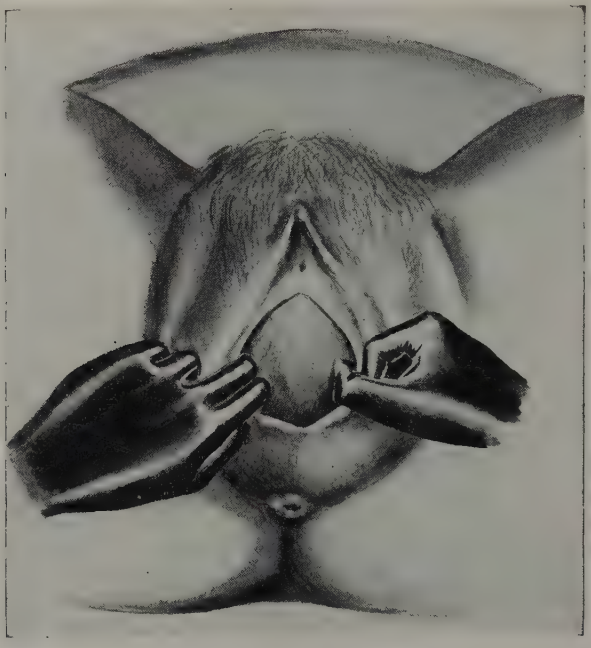


Fig 6145.—Manual Dilatation of the Margins of the Vulvovaginal Outlet – when the presenting part is engaged in the outlet.

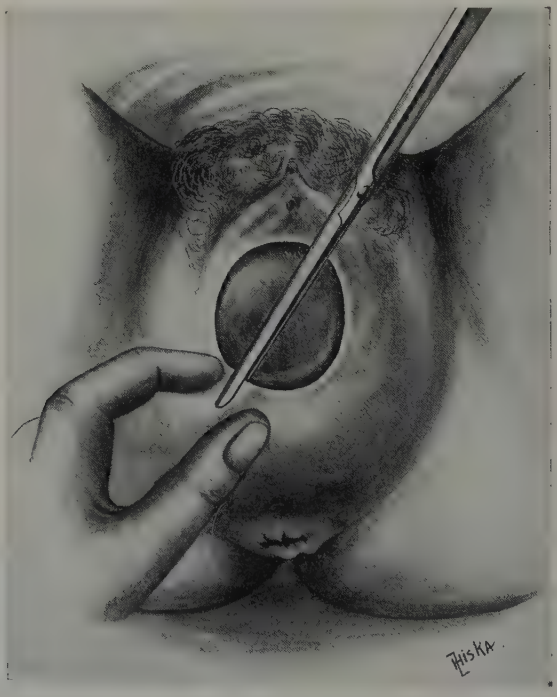


Fig. 6146.—Vaginoperineotomy – to increase the dilatability of the vulvovaginal outlet during childbearing or in premature emptying of the uterus.

the tendency of tensed structures to split beyond the actual cut _ and, for that reason, to cut in the interval between pains) _ or a single slightly oblique incision may be made on either side with blunt-ended scissors _ while the parts on each side of the scissors cut are supported by the thumb and first finger of the opposite hand _ as seen in Fig. 6146. The incisions, placed laterally on each side of the lower aspect of the outlet, are about 2.5 cm. (1 inch) long, and about 6 mm. ($\frac{1}{4}$ inch) deep, dividing only the skin, connective tissue, and possibly some fibers of the bulbocavernosus muscle. It is to be remembered that while such vaginoperineal sections may prevent very severe lacerations of the vaginoperineum which might otherwise occur, they may also serve as the starting-points of very much more extensive vaginoperineal lacerations than might otherwise have taken place _ through apparently adopted under wise indication and planned with the best judgment. They should be avoided when possible _ and, indeed, are rarely really necessary. Further, the source

Fig. 6147.—Vaginoperineorrhaphy Following Vaginoperineotomy.

of constriction is usually situated somewhat higher in the vaginal canal than the site incised.

The wound following vaginoperineotomy should be sutured at the end of delivery (vaginoperineorrhaphy _ Fig. 6147).

MANUAL OR INSTRUMENTAL RUPTURE OF THE FETAL MEMBRANES AFTER DILATATION TO EXPEDITE DELIVERY

When the intact membranes have discharged the irfunction of dilating the cervix they usually rupture of their own accord _ even if not prematurely. When dilatation is fully accomplished there is no further function for the bag-of-waters _ which may then really prove a barrier _ as well as a preventer of the engagement of the presenting head in the outlet. When these conditions prevail it is indicated to artificially rupture the membranes.

There may also be other indications for rupturing the membranes _ even before dilatation _ as, for instance, in placenta prævia (so that the child's

head may come down and compress the placenta, thereby preventing or minimizing hemorrhage through compression).

If the child should be born before the membranes are ruptured – as sometimes happens – they should be ruptured immediately – to keep the child from being asphyxiated by its own amniotic fluid.

Various methods have been employed for the artificial rupture of the membranes – which should always be accomplished during a pain – when the membranes are bulging through the os and are tense. In days before gloves were worn it was very convenient to rupture them with a nick cut into the nail of the right index-finger – using this in saw fashion over the prominently presenting and distended bag. At the present time they may be most conviently ruptured by means of one of the instrumental membrane rupturers, made to be worn over the tip of the right index – which is employed in the way shown in Fig. 6148.

Fig. 6148.—Rupturing the Membranes by Means of Wenck's Amniotome.

The membrnes are also easily ruptured by seizing their bulging aspect with a toothed forceps – after which the part is given a slight, controlled jerk. Or the membranes may be seized between two ribbed forceps (or even between the fingers if not too tough) and slightly torn.

REPOSITION OF THE PROLAPSED UMBILICAL CORD

The loop of the umbilical cord may present at the os even before the membranes rupture – and then be washed downward with the escape of the liquor amnii. Or, subsequent to the rupture of the membrnes, the cord may be forced down ahead of the presenting portion of the child. Its immediate reposition and maintenance above the site of compression are indicated – if these measures can be carried out – as the condition involves extreme danger to the child. It is sometimes difficult to replace the cord – and even more difficult to retain it in its replaced position and prevent its prolapse. The object sought is not only to replace the prolapsed cord, but to also hold it away from the opening of the os until the presenting portion of the child

engages in the opening, thereby preventing the recurrence of the prolpase of the funis. It must be remembered that the cord may be sufficiently prolapsed to endanger the child through compression of the presenting part, but not sufficiently to be seen or felt _ the outlook to the child being almost as grave. Prolapse of the cord is much rarer when the head presents than when other and smaller and more irregularly shaped parts present.

Postural treatment is all that can be done in the case of the so-called cord presentations _ that is, where the cord presents through the unruptured

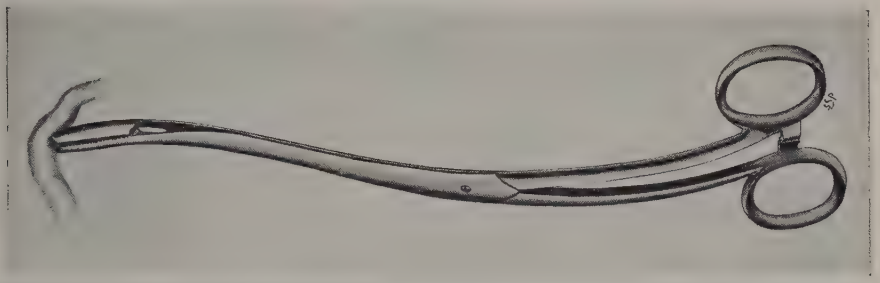


Fig. 6149.—Reposition of the Prolapsed Umbilical Cord by Uterine Dressing Forceps _ grasping the connective-tissue periphery of the cord, while carrying it within the uterine cavity

membranes. The three positions usually assumed are (the patient lying upon the side toward which the cord does not escape): the left lateroprone _ the modified Trendelenburg posture, over the back of an inverted chair, in the bed _ and the knee-chest position. The preservation of the membranes until the last moment is desirable _ and the encouragement of the presentation of some part of the child, preferably the head, which will block the further egress of the cord.

If the membranes have ruptured many methods of dealing with the cord have been practised.

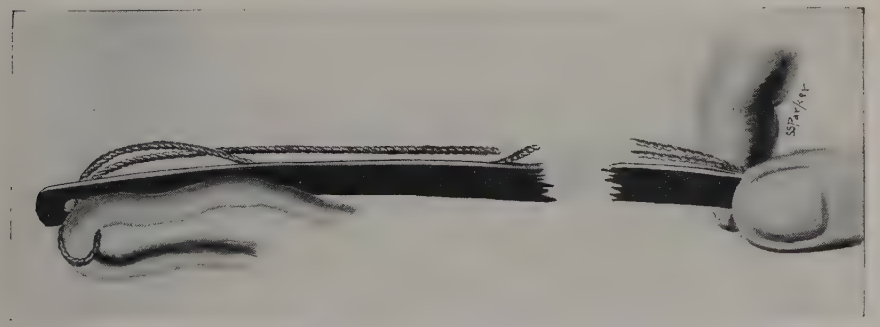


Fig. 6150.—Reposition of the Prolapsed Cord by Means of an Eyed Whale-bone and Loop _ I; _ Returning the cord to the uterine cavity.

The cord is sometimes replaced by the hand, while the patient is in a helpful position to this end (v. s.) _ and a Barnes, or de Ribes rubber bag placed within the uterocervical canal and distended _ for the double purpose of blocking the further propulsion of the cord, and to hasten dilatation. This probably represents the most modern method of action.

The cord is sometimes replaced manually or by instrument and the patient kept in the downwardly tilted position _ until through the progress of labor,

and the occupancy of the outlet by some other part of the child, the cord is not apt to re-engage at the os.

Among the instrumental means of reposition, several are in use:

The surrounding covering of the cord may be seized with long curved uterine dressing forceps (Fig. 6149) _ and, between pains, carried up and de-

Fig. 6151 —The Same _ II; _ Withdrawing the looped cord and whale-bone _ leaving the replaced funis within the uterine cavity.

posited in a relatively roomy part of the uterus, away from pressure _ and, if possible, left and kept there. In using a metallic instrument for reposition one must make sure of being able to entirely withdraw it before the succeeding pain comes on _ for serious damage may result from uterine contraction while the point of the instrument is within the uterus.

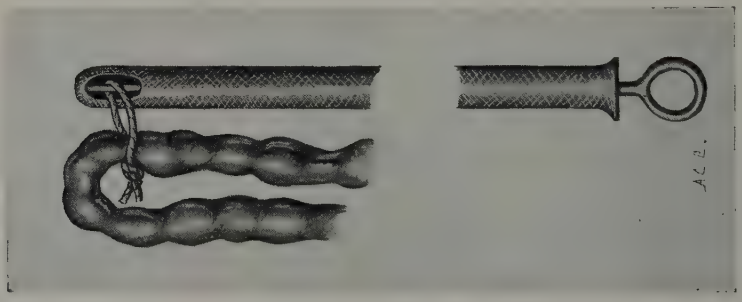


Fig. 6152.—Reposition of the Prolapsed Cord by Means of a Bougie and Stilet _ I; _ Carrying the loop of the funis, as well as the silken loop, into the uterine cavity _ the stilet being pushed home.

One of the most commonly adopted methods of replacing the cord, is by means of the perforated whale-bone _ which is procurable in almost every household. It may be sterilized _ as well as softened _ by being placed in bichlorid solution, 1 : 1000, and then thoroughly rinsed in saline solution. One of the features of the instrument, is that it need not imperatively be withdrawn before the on-coming pain, as it flattens itself out and adapts itself to

its surrounding wall and underlying parts and may be left to be born with the child. A loop of silk is threaded through the eye, around a loop of the cord – and the two ends of the loop of silk are brought down under the control of the finger and thumb which hold and introduce the whale-bone (Fig. 6150). When the loop of the cord, drawn up against the eye of the whale-bone, has been carried into the uterine cavity, traction is made upon one end of the silken loop, thus withdrawing the other end (Fig. 6151) – and leaving the loop of the cord within the uterus.

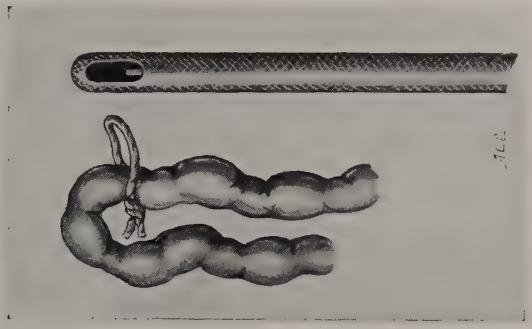


Fig. 6153.—The Same – II; – Leaving the replaced loop of the funis, as well as the silken loop, within the uterus – the stilet being withdrawn before withdrawing the bougie.

Semisoft bougies – especially of the webbed variety – have been often used in the same manner as the whale-bone guide. A short loop of silk is tied around the loop of the child's cord which has prolapsed. The opposite aspect of the loop is then passed into the eye of the bougie – the stilet of which is then passed through the silken loop and up to the extreme upper end of the bougie (Fig. 6152). When the funis has been carried back into the uterine cavity, the stilet is withdrawn just far enough for the silken loop to become free – after which bougie and stilet are entirely withdrawn – leaving the short silken loop around the child's cord, until after labor (Fig. 6153).

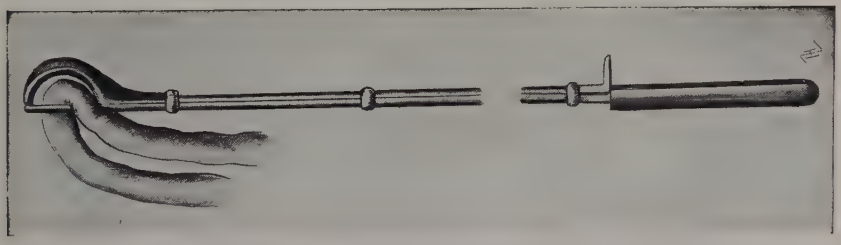


Fig. 6154.—Reposition of the Prolapsed Cord by Means of Schoeller's Cord-carrier – I; – Carrying the loop of cord back into the uterus – the funis being held in the grip of the closed instrument.

The same rôle played as just described, by the whale-bone and by the bougie-and-stilet, may also be carried out by Schoeller's cord carrier (Fig. 6154) – which is self-explanatory. When the cord has been replaced, it is released and left in position, by pushing the crooked end upward (Fig. 6155) – after which the crooked end is drawn back into place, and the instrument withdrawn. It cannot be left within the uterus during uterine contractions.

The aid in replacing the prolapsed cord by the patient's assuming the knee-chest position – no matter what method of reposition be adopted – is

shown in Fig. 6156. This position especially aids in retaining the cord in the upper part of the uterine cavity, after it is placed there – until some other part of the child can become engaged in the os.

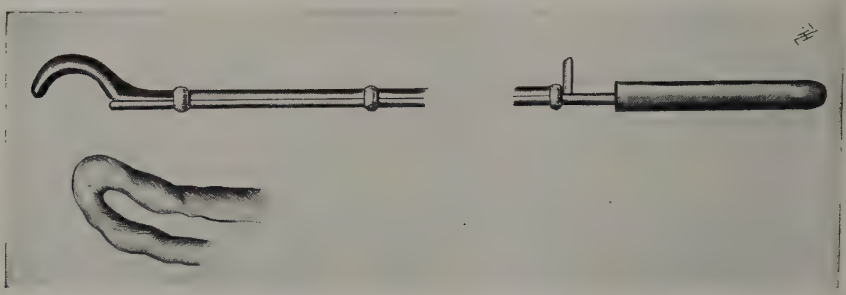


Fig. 6155.—The Same – II; – Leaving the cord within the uterus – releasing the cord by withdrawing the plunger of the instrument, as the latter is being removed.

The question of cesarean section sometimes arises when unsuccessful attempt is made to replace the cord and prevent it from again prolapsing.

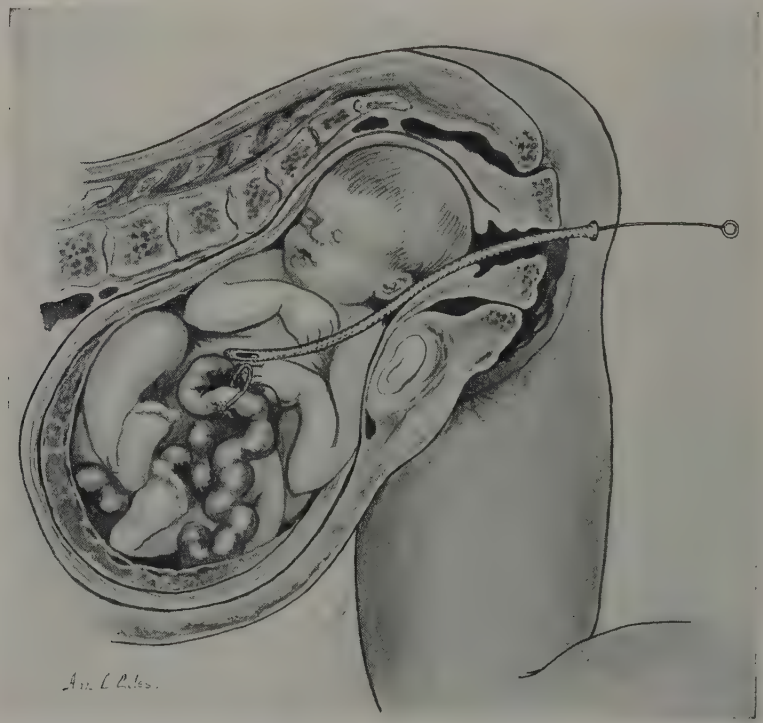


Fig. 6156.—Instrumental Reposition of the Prolapsed Umbilical Cord, with the Patient in the Knee-chest Position – showing the releasement of the cord well above the engaging head – which will subsequently block the tendency of the cord to come down.

Sometimes a single foot is brought down after practising version – the child's thigh blocking the os to the further prolapse of the cord.

Sometimes the cervix is packed with gauze – or distended by a rubber

bag _ with the patient in some modification of the Trendelenburg position _ until delivery can be expeditiously accomplished.

ARTIFICIAL DELIVERY OF THE RETAINED PLACENTA AND MEMBRANES

The placenta is normally expelled, by nature's own prompting and mechanism, during the first fifteen or twenty minutes following the expulsion of the child. If its retention be prolonged from one-half to one hour, it is usually considered indicated to remove it artificially.

One of two sets of conditions may explain the non-natural delivery of the placenta and membranes _ the placenta may have been separated from the uterine wall, but be retained within the uterine cavity _ and in other cases the placenta may still remain adherent to the uterine wall and, therefore, necessarily retained. In the first category of case, all that is required, is mechanical removal accomplished either from without, or from within the uterus. In the second category, the placenta must be first mechanically separated _ or become automatically separated _ before it can be artificially removed, or naturally expelled. Hour-glass contraction of the uterus may further complicate either of these conditions. The placenta is more apt to be adherent, than simply separated and retained if a thrill be felt in the tied end of the cord, when the fundus is compressed (Strassmann).

The placenta is sometimes entirely separated from the uterine wall and expelled partly or entirely into the vagina _ where it may be retained until artificially removed.

The most frequently resorted to measures for removing the placenta, when simply retained, is through manual expression from without, or manual delivery from within _ or by instrumental means. The most usual methods of removing an adherent uterus _ if the uterus be not excited to throw it off under external compression _ is by either manual, or instrumental means applied from within the uterus. If the placenta be extensively adherent, outside compression is not likely to be effective.

It is needless to observe that scrupulous care as to preparation of the patient's passages and the Surgeon's hand is necessary in these cases _ not only on general principle, but because direct contact is had with large raw surfaces and wide open venous and lymphatic channels.

It is generally advised to employ anesthesia in the artificial removal of the placenta. A few whiffs _ or partial deadening _ is probably wise. It has not been the Author's experience, however, in the manual removal of certainly considerably more than a hundred placentæ without anesthesia, that anesthesia was indicated _ the parts being largely deadened by the immediately preceding distention to which they have been subjected in the delivery of the child _ and also, through the same occurrence, too much overdistended to interferingly contract upon the advancing forearm.

The most frequently employed methods for the delivery of the retained, or retained and adherent placenta, will be given.

Manual Expression of the Retained Placenta, and Membrane, by Uterine Compression Applied Through the Abdominal Wall _ Credé Technic.—The basis of this procedure, is the reinforcement of nature's own effort to expel the placenta through contraction, by manually stimulating such contraction _ rather than, by mere force, to squeeze the placenta from the inactive uterus.

The method is begun at the approach of a pain, and continued during the pain. In the total absence of pains these are sought to be stimulated into existence by slight massaging of the fundus uteri through the abdominal wall.

The Credé technic itself consists in seizing the fundus of the uterus through the abdominal wall, by the fingers grasping the posterior aspect of the organ, with the nails directed backward, and with the thumb over its anterior aspect and its nail forward (Fig. 6157). As the pain reaches its climax the manual pressure and digital compression are brought to their climax – the pressure being applied directly in the axis of the brim of the pelvis – and the compression being applied circumferentially, or more strictly, anteroposteriorly, very much as a bean is squeezed from its pod – the patient, during the procedure, lying upon her back, with her knees drawn upward, to relax the abdominal wall and enable the hand to reach the uterus and literally grasp it – without which the procedure is only formal. There is, usually, a tendency to direct

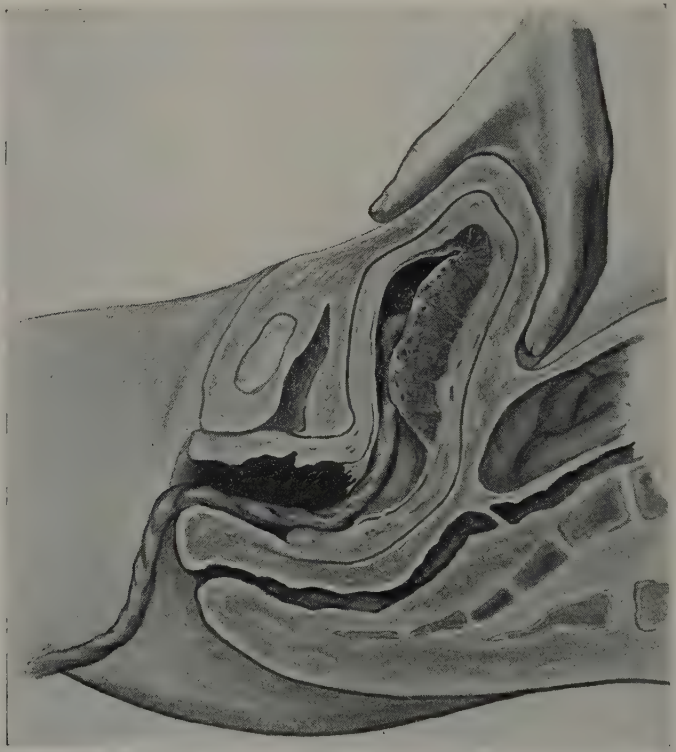


Fig. 6157.—Credé's Technic of Manual Expression of the Placenta and Membranes.

the pressure and compression too far forward – literally compressing the uterus against the symphysis and retarding its emptying. Sometimes the pressure is made in a backward direction. Some text-books actually direct that pressure should be made only downward – some forward, as well as downward – and some backward as well as downward. The guide is the axis of the pelvic brim – and as the placenta must be expelled along the combined axes of the parturient canal the sum total of these is predominantly downward, but slightly forward. The Credé method is more apt to accomplish the delivery of a simply retained placenta which has been already separated – but, naturally, there is likelihood that artificial aid of this very positive nature will tend to aid nature even in first separating a retained placenta, and then in expelling it – though the chief function of the method is to expel a simply retained placenta.

Manual Extraction of the Adherent Placenta and Membranes – or of the Retained Placenta and Membranes.—One should avoid rushing unnecessarily or too speedily into the manual invasion of the uterine cavity – often simply to terminate labor. If, however, after reasonable time – and after reasonable trial of the Credé method – the placenta and membranes are not forthcoming, there remains no alternative but to go after them. It is usually also indicated to invade the uterine cavity if only a part of the placenta and membranes are extruded – as determined by patching together the portions which are thus secured, and determing what proportion is missing, and whether of placenta or membranes. One would place the manual extraction of these as the method of second choice after failing with the Credé technic.

Fig. 6158.—Manual Extraction of the Retained Placenta – I; – Introducing the hand into the uterus and detaching the placenta from the uterine wall – while the fundus of the uterus is being depressed by a hand upon the abdominal wall.

The manual removal of the placenta is really a bimanual procedure – the Operator's left hand depressing and steadying the fundus of the uterus from without. A rubber gauntlet (covering the forearm to the elbow – and not merely a glove) should be sterilized and worn. (Such a gauntlet has been shown in Vol. I, Fig. 71.) The technic which the Author has frequently employed, is the following (in spite of one very good Writer's probably very worthy criticism – "But it may be taken for granted that the man who reports many cases of adherent placenta, or who often finds it necessary to introduce his hand into the uterus, has yet to learn the management of the third stage of labor.") – With the vulvovaginal canal thoroughly cleansed and prepared – the right hand and forearm guarded by an elbow-length gaunt-

let (which circumstances of necessity sometimes reduced to an ordinary rubber glove) – and invariably without either anesthesia or analgesia – the fingers, conically held, carefully work their way through the vulvovaginal canal, into the uterine cavity. The fingers are then flattened out, with their back directed to the wall of the uterus – and applied to whichever of the four uterine walls seems indicated, through the position of the adherent placenta. By a simultaneously combined onward advance and side-to-side movement of the hand – its back never leaving contact with the uterine wall – the tips of the fingers seek the normal cleavage line between uterine wall and the attached placenta – and, working in this plane, systematically separate the structure from below upward, and throughout as much of the lateral extent

Fig. 6159.—The Same – II; – The detached placenta is being withdrawn by the hand which has passed up under and above it.

of the uterine wall as the placenta and membranes occupy by adherence (Fig. 6158). When the upper aspect of the placenta is reached, the fingers are hooked over it – and it is withdrawn (Fig. 6159). This is the more natural method of progress and involves a less deep invasion of the cavity of the uterus. But sometimes the cleavage line is not readily detected until the fundus of the uterus is reached – and then the separation is accomplished in the reverse order – that is, by insinuating the fingers, with their back still to the wall of the uterus, between the raw surface of the placenta and the raw surface of the uterine wall – in this case, from above downward. In this case, the palm of the hand is converted into a hook at the beginning of the separation rather than at its end – approaching the cleavage line from above, with the backs of the fingers, from the knuckles directed toward the uterine wall,

but with the back of the hand in this latter technic, directed toward the cavity of the uterus.

In hour-glass contraction of the uterus, it may require some patience to bore through (Fig. 6160).

It probably often happens that placentæ and membranes which were considered to be actually adherent at the time of the introduction of the hand for their removal are found to be only retained, having already been separated – and are then simply mechanically removed by the hand, converted into the same form of scoop, or hook as just illustrated. It is probably in this category of cases that the above criticism very rightly finds its chief force.

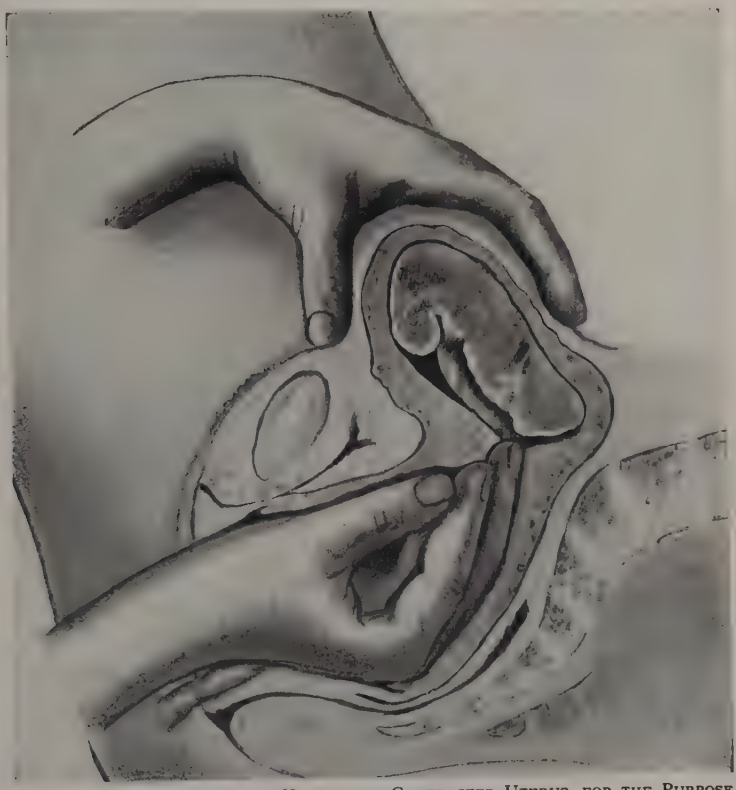


Fig. 6160.—Digital Dilatation of an Hour-glass Contracted Uterus, for the Purpose of Delivering a Retained Placenta.

Many Operators systematically irrigate the uterine cavity with some weak antiseptic solution whenever it has been found necessary to invade the organ with the hand. The Author has only done so in those cases where the circumstances made infection seem very likely to follow.

Infection following the introduction of the hand into the uterus, in obstetric work, even under the most adverse circumstances, has been so rare in the Author's personal experience that he has been absolutely at a loss to explain its infrequency – taking no particle of credit to himself, for many of the surrounding circumstances and conditions positively invited – and, indeed, theoretically and logically carried – infection.

Instrumental Extraction of the Retained or Adherent Placenta and Membranes.—The employment of long, slightly curved placental forceps of the types shown in Figs. 6161–6163, is resorted to sometimes but their use seems limited. It is hard to see how they can be very efficient in separating

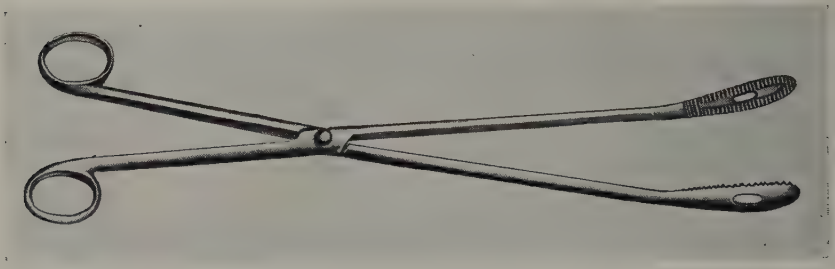


Fig. 6161.—Boldt's Placenta-forceps.

a retained placenta or how they can be very intelligently manipulated in such a case. When the hand is introduced into the uterus the fingers perform the same function, in so far as mere grasping of placenta and membranes is concerned, but only after learning the conditions to be dealt with and, therefore, accomplish the same ends both more intelligently and more thorough-

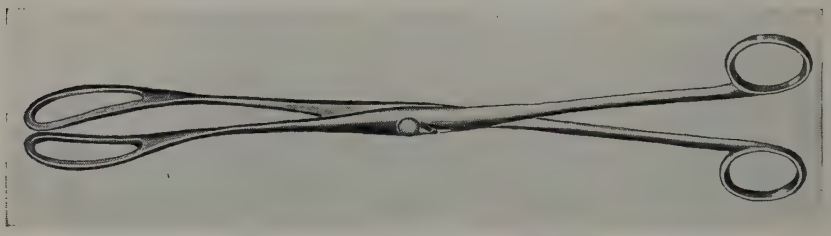


Fig. 6162.—Corey's Placenta-forceps.

ly. There would, however, appear to be some well-indicated usages for placental forceps; As they are thoroughly sterilizable they are much more safely introduced into the uterine cavity than is the hand, even gloved and, in those cases in which it cannot be positively determined whether the placental is still adherent, or merely retained, after separation, it would seem wise,

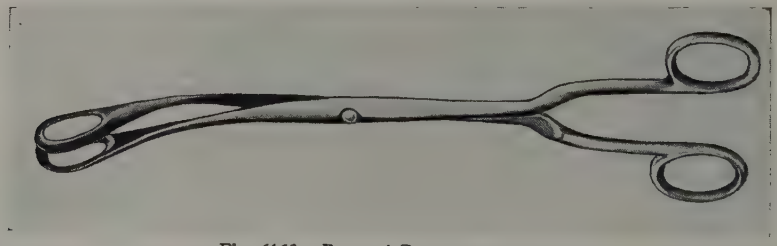
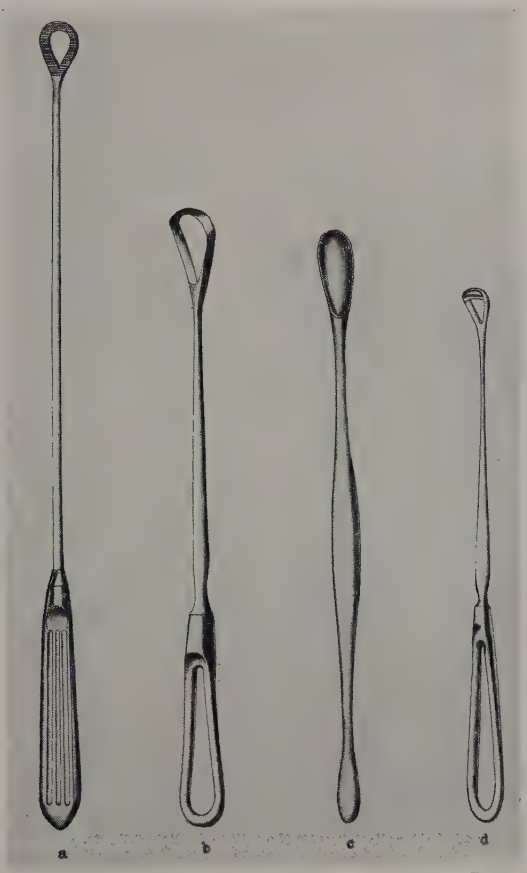


Fig. 6163.—Barnes' Placenta-forceps.

before introducing the hand, to verify this fact by introducing the placental forceps, when, if a separated placenta be merely retained in the uterus, it may usually be readily withdrawn by the forceps thus saving hand invasion. If, on the other hand, the grasped uterus reveals the fact that it is retained

because it is still adherent, then no harm has been done by its introduction and it may be withdrawn and the hand introduced for the actual separation of the placenta and its withdrawal. Again, the placental forceps may play a serviceable rôle where the major portion of the placenta and membranes have been expelled, either by nature, or by the Credé method – but a minor part is left behind, as determined by matching up the parts expelled – when the forceps are introduced and make reasonable search for the missing part – which if secured by the forceps is verified by a final matching up of the parts.

Removal of Retained Portion of the Placenta and Membranes, by Curettage.—This technic is more frequently employed for the removal of



Figs. 6164–6167.—Forms of Curets Useful in Removing Portions of Retained Placenta: – a, Greene's dull, serrated; – b, Bumm's sharp; – c, Engelman's double-ended, blunt; – d, Hirst's sharp.

small portions of retained, adherent placenta, or membranes, than for removing these structures *en masse*. The forms of curets generally used are such as are shown in Figs. 6164–6167 – and the technic, as carried out in Fig. 6168. It is needless to give caution as to the exceedingly great care required in curetting the newly emptied uterus. The curet should be used more as a careful separator and remover, rather than as a scraper. Some Operators advise the use of a dull curet for the separation of larger structures – and the sharp curet for finally going over the surfaces and removing the smaller

attachments. It might be wiser to advise the usage, throughout, of the dullest curet which it is felt will remove the structures.

The curetment is sometimes unwisely performed digitally, without gloves _ using the finger-nails _ after introducing the entire hand into the vagina, and only the first two or three fingers into the uterine cavity _ while the upper part of the uterine cavity is brought down into contact with the intra-uterine fingers by depression of the organ through the abdominal wall.

Removal of Retained, or Adherent Placenta and Membranes, by the Combined Use of the Fingers and Placental Forceps, or the Fingers and the Curet.—The hand is introduced into the vagina, and the first two or three fingers into the uterine cavity, as in the preceding method _ while the fundus is depressed through the abdominal wall, to enable the fingers to more satisfactorily reach the inner uterine walls everywhere. A pair of uterine dressing forceps, or placental forceps _ or a curet _ is then passed alongside the fingers, into the cavity _ and the special instrument chosen is

Fig. 6168.—Cureting Away Portions of Retained Placenta and Membranes.

made to operate upon the retained, or adherent structures in connection with the gloved fingers which are also in the cavity of the uterus.

OPERATIVE TREATMENT OF PLACENTA PRÆVIA

Placenta prævia is said to exist when the placental implantation is such with reference to the internal os, that separation of some portion of its substance, with consequent hemorrhage, is due to occur during the development of pregnancy or at the time of labor.

The usual forms of placenta prævia are _ central, or complete, in which the placenta completely covers the internal os (Fig. 6169) _ partial, in which it partly covers it _ marginal, in which the attachment extends up to, but does not transgress, the internal os _ and lateral, or low placental implantation, in which the attachment is in the lower uterine segment, sufficiently near the internal os for its attachment to be disturbed by uterine expansion, distention, or contraction.

This pathologic condition constitutes one of the greatest emergencies of pregnancy – and the methods of meeting the actual occurrence of hemorrhage will largely depend upon whether the cervix is contracted – or dilated (or readily dilatable) – at the time.

Polar Version and the Bringing Down of a Leg in Placenta Prævia, When the Cervix is Dilated, or Readily Dilatable.—If the cervix be already sufficiently patulous, one may procede at once – either by bipolar, or internal polar version. If only partially dilated, the rest of the dilatation is promptly accomplished by the bimanual method. The membranes are then at once ruptured – preferably marginally – in hope that the hand may also be introduced into the uterine cavity along the side or margin of the placenta (Fig. 6170). But if this be impossible, the hand is carried directly and boldly through the center of the placenta. The flooding is momentarily increased –

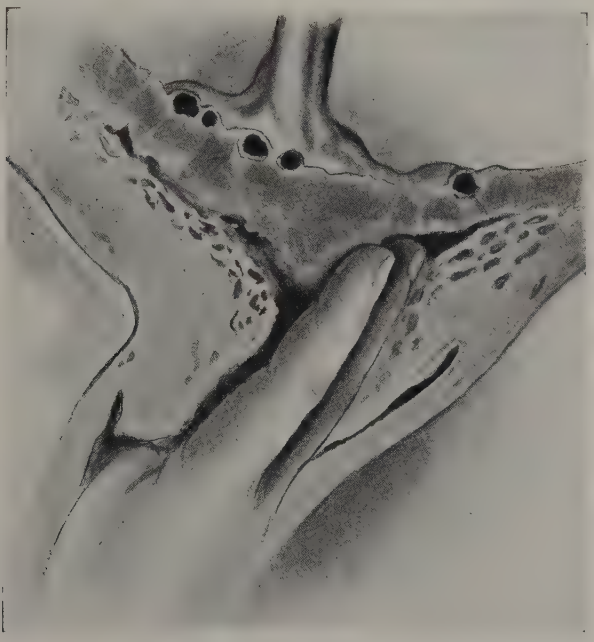


Fig. 6169.—Central Placenta Prævia – Digitally Detached Over the Internal Os.

but is due to be somewhat lessened as the forearm blocks the way and compresses the parts. Aided by the hand without, the hand within the uterus at once seizes a foot – and draws it down and out, along the route the hand, or forearm just entered – plugging the uterine outlet by the child's thigh – which is drawn down far enough to serve this purpose (Fig. 6171). The foot is wrapt in gauze for better holding, and the part is kept under even tension, without practising traction – as it is not planned, or at all wise, to drag the child out of the uterus. The object sought, is to secure the engagement of the child's thigh in the cervix and lower uterine segment – and then allow nature to accomplish its expulsion – hemorrhage usually being arrested, the meantime, by circumferential pressure of the child's thigh and hip against the placenta, which is pinioned between it and the uterine wall. The mother's mortality rate is lowered by this technic – at the cost of increase in the child's. Hemorrhage from the placental site will often cease as soon as the uterus is emptied

Fig. 6170.—Rapid Dilatation of the Cervix and Digital Separation of Centrally Placed Placenta Prævia.

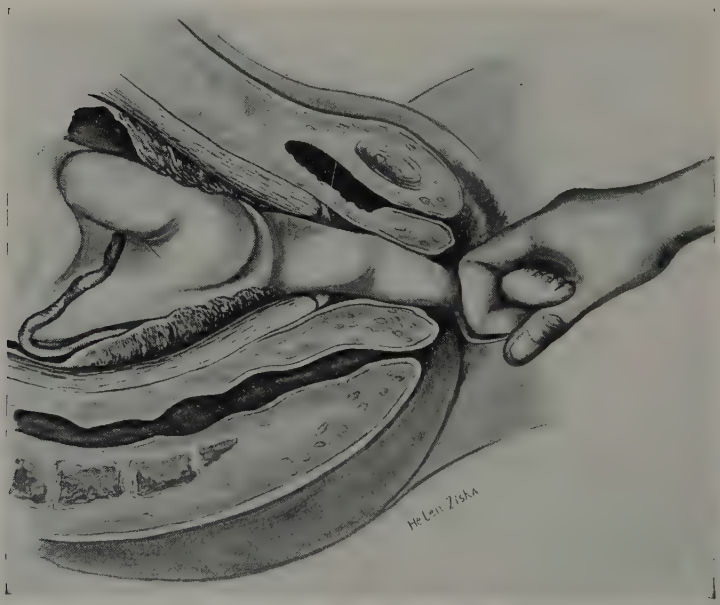


Fig. 6171.—Plugging, or Tamponing the Lower Uterine Segment with the Child's Breech, in Placenta Prævia; – The placenta is pierced by the fingers, or marginally circumvented – the hand is introduced into the uterine cavity – podalic version accomplished – and the breech made to compress the placenta, by traction upon the foot, until delivery is accomplished. The child's leg, in this case, pierces the center of the centrally placed placenta.

– but may continue – and if it does, the hand should be introduced and the placenta prævia separated and removed.

Treatment of Placenta Prævia When the Cervix is Closed, by Preliminary Cervical Dilatation by Hydrostatic Bag – Followed by Spontaneous, or Forced Labor.—The case may be one in which there is some element of doubt – as to whether the hemorrhage be merely an accident in the course of a normally placed placenta, or whether from placenta prævia. Unless the finger can be introduced through the cervical canal and internal os, it may be, and generally is, impossible to definitely determine this. If the os be closed, the only alternative will be to carry the finger through the cervical canal, under anesthesia. Before this is done, all should be made immediately ready for possible placenta prævia, in case it be encountered.

Fig. 6172.—Treatment of Placenta Prævia, by Manual Dilatation of the Cervix, and Digital Penetration of the Centrally Placed Placenta – which may be followed immediately by the manual delivery of the child – or by the placing of a distending hydrostatic bag.

If placenta prævia be present, the os should be digitally, or instrumentally dilated until sufficiently large to take a hydrostatic bag. Before the bag is passed into position, the membranes must be ruptured – for, otherwise, the placenta would be apt to be further separated, by pushing the bag up against the unruptued membranes, rather than through them. In rupturing the membranes, more or less traumatism may be done the placenta itself, dependent upon the nature and position of its attachment. For these reasons, the maneuvers should be promptly executed – and the bag carried immediately into position and distention begun, so as to compress the torn, or penetrated placenta (Fig. 6172). The combined escape of the liquor amnii and the presence of the distending bag will all tend to promote uterine contraction.

If bleeding stops and all goes well, the case should be left to nature. The

bag will usually be spontaneously expelled in from six to eight hours. If bleeding occurs, the bag may be reasonably weighted, or gentle traction be kept upon it by hand. When the bag is expelled, some part of the child has usually taken its place, so that pressure upon the placental site is maintained – and the birth of the child can often be henceforth left to nature. On the other hand, the child may upon expulsion of the bag, be immediately delivered by forceps – or by internal podalic version. If bleeding continue after expulsion of the bag, the latter course is probably the better – unless it be thought that evacuation be otherwise very speedily accomplishable. Sometimes it is necessary to bodily draw the child through the parturient tract – endeavoring, however, to avoid traumatism to the latter.

If bleeding continues from the placenta after the child is born, or has been delivered, then such bleeding is not materially dissimilar from ordinary postpartum hemorrhage of placental site origin, except as to the unusual

Fig. 6173.—Packing of the Cervical Canal and the Vagina, in Placenta Prævia.

position of the placenta. Under such circumstances, the hand should be carried boldly into the uterus and the placenta manually removed – as it is under those circumstances. Every chance should, in the absence of hemorrhage, be first given for the spontaneous expulsion of the child – and, if hemorrhage be still absent, manual expulsion by the Credé method should be first tried – before resorting to intra-uterine, manual removal.

It is chiefly in connection with cases in which the membranes cannot be reached for puncture, or a thick centrally implanted placenta is encountered, that the alternative procedure of cesarean section may be considered.

Treatment of Placenta Prævia, by Tamponing the Cervix and the Vagina – Both to Arrest Hemorrhage and Cause Dilatation – Preliminarily to Spontaneous, or Forced Delivery.—This method was once much in vogue – and the outfit for its performance in emergency is certainly the most generally accessible of the various paraphernalia often required for

other technics. Putting it a bit crudely, it is the application to this emergency, of the instinctive act of plugging the bung-hole of a leaking hogshead of wine with the finger, until some better method of control may be improvised. The patient is preferably placed in Sims' position, and the posterior vaginal wall held back by a tractor, so as to spaciously expose the vagina, which can be more largely done in this position than in any other. In the majority of instances, the os is soft and dilatable – and if more patulousness be required, the finger can usually accomplish this by guardedly boring its way, under a few whiffs of anesthesia. Strips of selvaged gauze are then carried through the cervical canal, by means of a curved uterine dressing forceps. These strips are systematically, compactly, and tightly packed – not simply carried in loosely and at random. The result of the technic is largely dependent upon the efficiency with which it is performed. This packing is carried directly up against the overlying placenta – unless, fortunately, the membranes can be encountered marginally and ruptured. When the cervical canal is tightly packed (Fig. 6173) – the vaginal canal is also systematically and tightly packed – because it is upon this latter packing that the cervical packing must rest and secure its lower support. Very much more gauze, in wide strips, is required than usually estimated in advance. Finally, the vaginal packing is, itself, held in place, against the cervical pack, by means of a tightly placed perineal T-bandage. The object of this technic is both to mechanically stop the bleeding, and to cause sufficient dilatation to enable the uterus upon the removal of the pack either to empty itself if, fortunately, a part of the child is engaged which blocks further bleeding – or to be emptied manually or instrumentally – or to enable the leg to be brought down by bipolar version, or by internal version.

Rupture of the Membranes as an Adjunct in Placenta Prævia.— Various and opposite views have been held in this connection. It has been considered an advantage to rupture the membranes if a cervicovaginal tampon has been employed and considerable hemorrhage continues in spite of it – or when uterine contractions are absent – but not when the uterine action is vigorous and the os is closed.

Treatment of Placenta Prævia by Abdominal Cesarean Section.— The present-day trend is to apply cesarean section more and more frequently to cases of placenta prævia. The especial class of cases in which it finds its greatest usefulness, are those in which a complete, or central placenta prævia exists – in which the membranes cannot be reached – in a woman, especially a primipara, with a closed or hard and unyielding os – and particularly in the presence of some additionally complicating condition. The technic of abdominal cesarean section is given at p. 760.

VERSION

By version, or turning, is meant the artificial substitution of one form of presentation for another – intended to replace a more unfavorable for a more favorable position of the child.

Version may be – according to the part of the child caused to present and become engaged at the inlet of the pelvis – either cephalic version, or podalic version (and, rarely, pelvic version).

Version may also be – according to the method of its production – external version, brought about by external manipulation – bipolar, or combined external and internal version, accomplished by the fingers, only of one hand, within the uterus, while the opposite hand manipulates from outside of the abdomen, both hands acting upon the position of the child – internal version

accomplished by introducing one hand into the uterus, while the other hand aids from without.

Fig. 6174.—Cephalic Version, in Breech Cases, by External Manipulations – the head is being directed to the superior inlet by the shortest way – while the breech is being pressed in an opposite direction.

Indications for the employment of version are the following; – shoulder presentations – transverse presentations – difficult head presentation, in which

Fig. 6175.—Wiegand's External Cephalic Version, in Transverse Presentations.

at the same time forceps may be contraindicated – presence of prolapsed funis, or extremities – placenta prævia – and such conditions as premature detachment of a normally placed placenta, eclampsia, and the like.

A large combination of technics is possible, in proportion as various forms of version are applied to the various presentations. Some of the chief forms of these will be considered in the following pages.

External version; – The patient is in the dorsal decubitus, with the abdominal wall as relaxed as possible. The technic is practised between pains. No anesthesia is ordinarily used. The outline of the child should be definitely estimated – as the only intelligent basis of applying forces to alter its position for better. In a supposed case of external cephalic version, in breech presentation, the palm of one hand is placed over the head and that of the other over the breech (Fig. 6174). The effort is then to cause these two poles to

Fig. 6176.—Braxton Hicks' Bipolar Podalic Version – I; – Two fingers, introduced within the uterus, displace the head (here presenting) to one side, and upward upon this side – while the opposite hand, without, presses the fundus downward and toward the opposite side.

change their position – by gently stroking the head downward by the shortest route, and the breech upward, each traveling along its own wall of the uterus. Effort should be made to conduct this transition *en mass* – that is, favoring the retention of flexion of the head and limbs upon the body, rather than their separation. When the child's body has been changed into the desired position, it is held in this position until it becomes engaged by the natural forces – or, in the absence of these, and if the os be sufficiently dilated, until it is grasped by forceps.

The application of external cephalic version in transverse presentation, is seen in Fig. 6175.

Bipolar, or combined external and internal version — Braxton Hick's technic; — Supposing the case to be one of left dorsoposterior presentation, in which it is desired to bring down a leg through the os. The patient is placed in the dorsal gynecologic posture, with flexed knees and anesthized. The position of the child having been verified, the palm of the right hand is placed over the fundus of the uterus — while two fingers of the left hand are carried through the vagina and into the uterus (Fig. 6176). While the outer hand displaces the buttocks along the right uterine wall to the right and downward, the intra-uterine fingers carry the head upward along the left uterine wall. As the head ascends, the breech descends. In this excursion, the fingers may come into contact with the crossed arms, or some part of the child's thorax, which after the head is passed out of reach, is also pushed

Fig. 6177.—The Same — II; — One foot is now caught between the two fingers and is drawn out of the uterus — while the opposite hand continues to press the fundus downward.

by the fingers in the same direction that the head was carried. Eventually a knee may be felt — and finally, a foot. Up to this time, effort has been made to preserve the membranes, with their distending fluid, as the best medium through which to shift the position of the child. When contact with the lower limb has been reached, however, the membranes are ruptured — and a foot seized between the fingers (Fig. 6177). One recognizes the foot by its heel — and must not make the mistake of grasping a hand. The foot is drawn down until the ankle can be firmly seized — when the leg and thigh are drawn down — as the head passes up to the fundus of the uterus (Fig. 6178). Whether immediate delivery is then carried out by extraction — as is usually the case — or whether delivery be left to nature — will be determined by the nature of the special case.

Bipolar version in shoulder presentation is accomplished upon the same general principles as just described in cephalic cases – with the necessary substitutions to meet the differences in the presenting parts. The outer hand is placed over the breech of the child (Fig. 6179). The internal fingers (of that hand which normally flexes in the direction of the child's head) displace the presenting shoulder toward the fundus – while the outer hand depresses the breech into the lower uterine cavity. As soon as a foot (usually the anterior one), or knee can be reached by the intra-uterine fingers, it is grasped and drawn downward and outward – while the hand which was

Fig. 6178.—The Same – III; – The grasped leg is brought down and out through the vulva – forming a half-breech.

following down the breech is shifted and applied to the lower aspect of the head, which it then lifts toward the fundus of the uterus (Fig. 6180). When one of the lower limbs has been brought down, the case is terminated as indicated.

The same general principles apply to transverse presentations.

Internal podalic version, in head presentations; – The patient is anesthetized and brought to the edge of the table, or bed, with the thighs flexed. The bladder and rectum should be empty – and every provision made against infections. Diagnosis of the exact presentation should have been made.

The object of the maneuver to be undertaken is to carry a hand into the uterine cavity and bring down one, or both feet _ while the head, which was presenting, is aided in its upward passage to the fundus of the uterus by the hand upon the abdomen. Presupposing that sufficient dilatation has taken place that hand of the Operator should be introduced into the uterus whose palm most readily adapts itself to the child's abdominal wall (Fig. 6181). The membranes are ruptured. The hand is advanced only during intervals between pains _ the external hand making counterpressure through the abdomen all the while _ and the internal hand being flattened and kept motion-

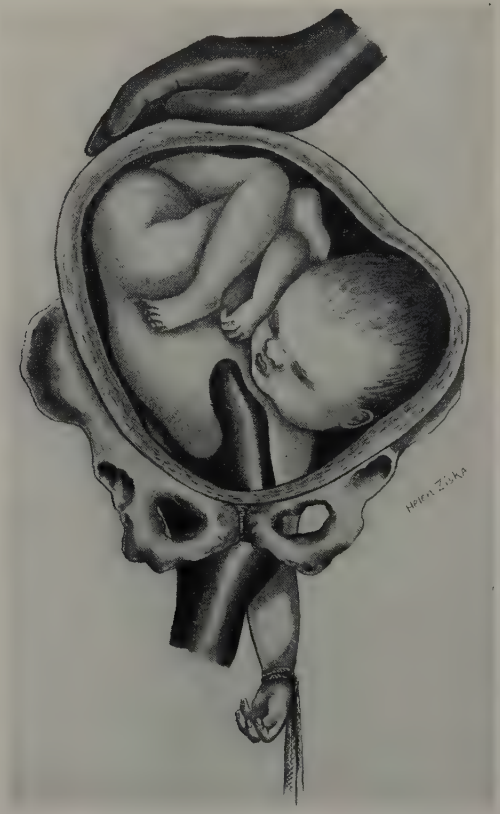


Fig. 6179.—Bipolar Version, in Shoulder Presentation _ I; _ The inner hand frees the engaged shoulder and insinuates its way on up toward the fundus, to the feet. The outer hand steadies the uterus and slightly depresses the breech, bringing the feet within reach. A fillet is placed upon a hand, if prolapsed, in case it be needed for future control. Only two or three fingers are ordinarily carried into the uterus.

less during pains. The greatest difficult is usually experienced in passing the head _ which must be carefully displaced toward the iliac fossa opposite the side occupied by the hand. Thus progressing, one or both feet are encountered. The fingers grasp one or both feet. Usually the anterior foot is seized and brought down (Fig. 6182). If both feet are brought down they make a better dilator. Sometimes it is easier to hook a finger into the flexed knee and bring it through the cervix, if a single limb is to be brought down _ whereas both feet may be sometimes seized together, if both are to be brought down. The future course of the case will depend upon its nature.

Fig. 6180.—The Same – II; – The upper foot is seized by the inner hand and drawn carefully into the pelvis, along the wall of the uterus – while the outer hand elevates the head and trunk, from without.

Fig. 6181.—Internal Podalic Version, in Head Presentations; – Operator's left hand grasps the child's right foot – while counterpressure is being exercised upon the uterus from without, by the opposite hand.

Fig. 6182.—Internal Podalic Version, in Head Presentations; – Downward traction upon the foot with the internal hand – and upward pressure upon the head and shoulders with the external hand

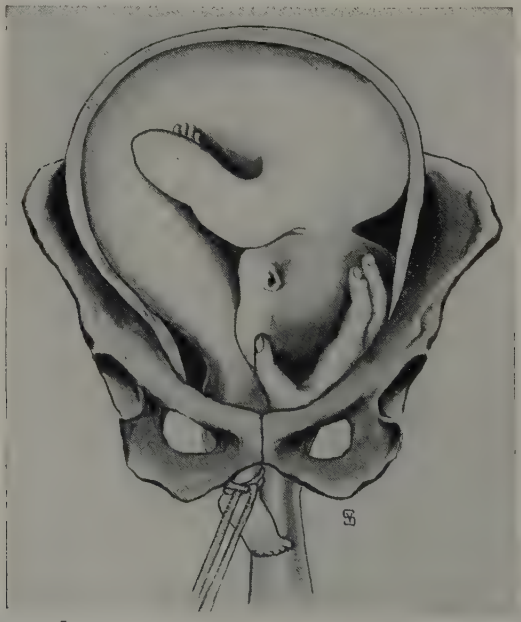


Fig. 6183.—Combined Internal Manipulation, by Podalic Version and Head Elevation, in Difficult Cephalic Presentation; – Firm traction upon the delivered foot, by means of a soft fillet, and upward pressure upon the head, by a hand within the uterus.

Internal podalic version in head presentation, by combined leg traction and head elevation; – Cases of cephalic presentation, especially after the mem-

Fig. 6184.—D'Outrepont's Combined Internal and External Cephalic Version, in Shoulder Presentation; – The inner hand elevates the presenting shoulder, in the direction of the breech – while the external hand depresses the head into the pelvic inlet.

Fig. 6185.—Busch's Method of Combined Internal and External Cephalic Version; – The right hand, here, grasps the head within the uterus, and draws it downward to the internal os – while the opposite hand, without, presses the fundus upward.

branes have ruptured and the uterus has more closely grasped the parts, occur in which it is difficult to accomplish internal version alone, or even with external aid. In these cases success in turning may sometimes be accomplished

— by means of downward traction upon a delivered foot on one side by means of a fillet, combined with upward pressure of the head, by an intra-uterine hand, on the other side (Fig. 6183). Anesthesia is often of aid.

Combined internal and external cephalic version, in shoulder presentations — d'Outrepont's technic; — One hand is carried into the uterus, and the other aids from without. In the intervals between the uterine pains, the intra-uterine hand pushes the uterus upward, a little at a time, in the direction occupied by the buttocks — until gradually the head reaches the pelvic inlet — aided in its descent by the outer hand (Fig. 6184).

Combined internal and external cephalic version, in shoulder presentations — Busch's technic; — A hand introduced into the uterus seizes the head and draws

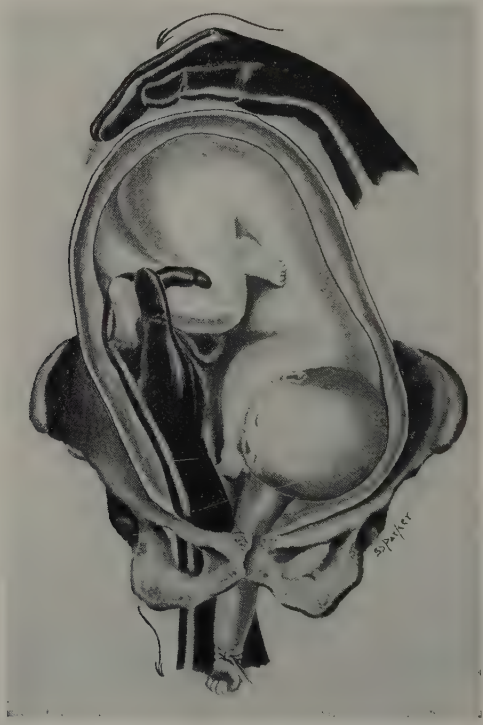


Fig. 6186.—Combined Podalic Version, in the Left Scapulo-posterior Position of the Shoulder; — The inner hand bringing down the forward foot — while the outer hand aids by depressing the breech from without.

it toward the cervix — while the outer hand displaces the breech upward — as shown in Fig. 6185. The hand which seizes the head (the right, if the head is on the left — and the left, if the head is on the right) forms a cradle for it, as it were, between thumb and little finger, laterally, with which the grasping is done — and the middle fingers as a bed.

Internal podalic version, in shoulder presentations; — That hand should be carried into the uterine cavity whose palm best adapts itself to the child's legs — which is the left in left scapula positions — and the right, in right scapula positions. The hand within the uterus should seize the lower leg, in scapulo-anterior presentations — and the upper leg, in scapuloposterior positions. This technic will tend to keep the back of the child toward the symphysis — as well

as deliver the leg by the shortest route. The descent of the breech is aided at first by the hand without – which then assists in the elvation of the head. The procedure is illustraged in Fig. 6186.

Internal podalic version, in transverse presentations, with back anterior; – The lower foot is the better one to be seized – the reverse of that shown in Fig. 6187 – for, by so doing, the dorsum of the child is held in relationship with the symphysis – while seizure of the upper foot, as erroneously illustrated,

Fig. 6187.—Internal Podalic Version, in Transverse Presentations, with Back Anterior; – Seizure of the upper foot and downward traction with the inner hand, is here shown – during upper pressure with the outer hand. Loose fillet around prolapsed arm, to prevent its retraction and extension over he head. Seizure of the lower foot is better (v. text).

would tend to direct the child's back posteriorly toward its mother's back. External pressure is employed to aid in raising the head.

Internal podalic version, in transverse presentations, with back posterior; – The upper foot is the preferable one to grasp – the reverse of that wrongly shown in Fig. 6188 – for, the back of the child will be thereby made to turn toward the symphysis. If the lower foot were seized in these cases the buttock, even though it would tend to turn anteriorly, would also tend to become impacted against the anterior pelvic brim. Pressure of the outer hand will aid in the elevation of the head.

Fig. 6188.—Internal Podalic Version, in Transverse Presentations, with Back Posterior;—Seizure of the lower foot is here shown, and downward traction with the inner hand—during upward pressure with the outer hand. Loose fillet around prolapsed arm, to prevent its retraction and extension over the head. Seizure of the upper foot is better (v. text).

CESAREAN SECTION, IN GENERAL

The term, cesarean section, has usually been applied to delivery of the child through an incision made, first through some part of the abdominal wall—and then through the uterine wall. This is generally made transperitoneally—but, sometimes, extraperitoneally. More latterly it has come to be also applied to delivery of the child through a uterine incision, made by way of the vagina, through the cervix and lower segment of the uterus. Exceptionally the procedure has been employed to quickly deliver a living child from a dead mother (postmortem cesarean section).

Julius Cæsar is reported to have been born in this manner.

The forms, therefore, of cesarean section, are—transperitoneal—extraperitoneal—and vaginal.

Cesarean section may be performed under any circumstances which render the birth of the child through the natural passages impossible, or unusually dangerous. The indications for cesarean section, however, come under two heads:—Absolute Indications—as in bony deformity of the pelvis (where the true conjugate is under 5.5 cm., or $2\frac{3}{16}$ inches, according to Bumm, and to Shears, or under 7.7 cm., or 3 inches, according to Kerr)—where a tumor, of the uterus, or of adjacent structures, blocks delivery—in scar stricture of the birth canal—and in some cases of rupture, or of displacement of the uterus.

Relative Indications – contracted pelvis – accidental, or concealed hemorrhage – placenta prævia – funicular prolapse – and some cases of obstruction of the soft parts, and rupture of the uterus – in all of which it might have to be first decided whether forceps, version, symphyiotomy, pubiotomy, or craniotomy would not be as well – or better.

Contraindications – a non-viable, or a dead child is usually considered to contraindicate cesarean section.

The more special indication for vaginal cesarean section, is considered to be obstruction of the soft, rather than of the bony parts. The technic was devised to avoid the dangers of intra-abdominal operation – and the possiblility of consequent hernia. But it is not possible, as abdominal ceasarean section is, if the true conjugate be under 8 cm. ($3\frac{1}{8}$ inches).

It is especially indicated that cesarean section should be a primary, and not a secondary, operation – that is, that the operation should be performed before one, or several other methods had been tried, and not as a last resort – and that it should be performed in the absence of infection – and while the child is alive – and the mother's condition good.

It is of paramount importance to operate before infection occurs (through other manipulations) – and not to let it occur during – or after operation.

The two chief risks in operating, are, hemorrhage and infection.

Cesarean section – by the median transperitoneal route – is generally considered a safer and better operation, for both mother and child, than either symphiotomy, or pubiotomy.

Differences of view prevail as to the best time for operating – whether prior to, or during labor. The majority would seem to prefer to operate after labor has been in progress for several hours – as not involving the possible error of the stage of pregnancy reached and date delivery is due, and, therefore, the possibility of a premature child – as giving the mother a test chance to deliver her own child – as less likely to involve hemorrhage from uterine atony. Some favor operating just before labor begins, in multiparæ – and not until after it has begun, in primiparæ.

Routh's figures indicate, that in women operated upon in early labor, under favorable conditions, and before being subjected to examinations, the death-rate was from 2 to 3 per cent. for the mother – and 1 per cent. for the child – wheras it was from 20 to 30 per cent. if operated upon in advanced labor and after examinations and other efforts at delivery had been made.

Possible courses which may be followed in performing abdominal transperitoneal Cesarean section, are the following:

(1) Cesarean section, followed by retention of the intact uterus, without sterilization. This constitutes the conservative operation – which is the most desirable, as the most ideal. This will be described in detail.

(2) Cesarean section, followed by sterilization, accomplished by double partial salpingectomy to prevent recurrence of pregnancy under circumstances of impossible natural delivery. The main operation is performed as in the preceding method – after which, while the abdomen is opened, parts of both fallopian tubes are removed in the manner described at pp. 564–568 – and will not be separately described here.

(3) Cesarean section, followed by supravaginal hysterectomy, with the retention of ovaries – and tubes if uninvolved. This procedure is indicated in such conditions as the presence of uterine myomata too numerous, or large to make future pregnancy safe, or to admit of myomectomy – in some marked displacements of the uterus – in some cases of accidental hemorrhage – in uncontrollable postpartum hemorrhage. The details of the operative steps are pictured and described on pp. 462 and 783.

(4) Cesarean section, followed by total hysterectomy, with the retention of the ovaries, and also the tubes, if not involved. This technic is indicated in malignant involvement of the uterus _ in uterine sepsis _ and usually in uterine rupture. The method of puerperal hysterectomy will be described and illustrated later (v. Index).

CESAREAN SECTION, BY THE TRANSPERITONEAL ROUTE _ BY MEDIAN ABDOMINAL INCISION. (TRANSPERITONEAL CELIOHYSTEROTOMY.)

Description.—The opening of the abdominal cavity through a median division of the abdominal wall _ the opening of the uterine cavity through a median division of its anterior wall _ followed by the manual, or instrumental extraction of the child, through the combined abdominal and uterine incisions _ and the restoration of the uterine and abdominal walls by suture.

The general bearings of the subject are treated under Cesarean Section, in General, p. 760.

Preparation.—In the cases which are deliberately operated upon in advance of labor, the usual routine of preparation for intra-abdominal operation holds _ as to preliminary care of the gastro-intestinal tract _ and disinfection of the abdominal skin. In those cases, however, in which operation is undertaken during labor, and without foreplanning, as in the majority, the surface is usually dry-shaved, and painted with tincture of iodin (half or full strength).

The bladder should be invariably emptied.

Some Surgeons are in the habit of preliminarily injecting, hypodermically, some preparation of pituitary gland (or ergot) _ properly timed in advance of the actual operation to secure its action in stimulating the uterus to increased contraction immediately following the removal of its contents.

Position.—The patient may rest upon her back, in the horizontal posture _ but a moderate Trendelenburg position is helpful in causing the intestine to gravitate toward the diaphragm.

Anesthesia.—Ether-oxygen is probably the best. Nitrous oxid is bad for the fetus.

Landmarks.—Ensiform cartilage _ navel _ symphysis pubis.

Incision.—(*a*) If the uterus is to be delivered outside of the abdominal cavity before being opened _ which is the general and the preferable technic _ the incision is usually about 25. cm. (10 inches) in length _ placed in the median line (except where it passes around the umbilicus, on the left), one-half of the incision being above the umbilicus, and one-half, below _ or two-thirds of the incision, above, and one-third, below. (*b*) If the uterus is to be opened while still within the abdominal cavity, an incision of about 20 cm. (8 inches) generally suffices. (*c*) If it be planned in advance, to remove the uterus, after delivering its contents, the major portion of the incision should lie below the umbilicus _ which will give much better access to the structures which are to be ligated and divided.

Operation.—The abdominal cavity is opened and the margins of the abdominal wall retracted in the usual manner. In cutting through the peritoneum, the prominent uterine wall, which is due to have crowded the intestines to the sides and below, is at once encountered. Intestines, however, may lie in front, and adhesions may complicate _ as, also, may the bladder. It is well to at first make a limited incision, and then to increase this upon the finger as a guard _ especially safeguarding the updrawn bladder.

If the uterus is to be delivered through the abdominal incision before its cavity is opened _ which is the generally adopted course _ the Surgeon carries his right hand over the fundus _ while an Assistant presses the abdominal wall downward, on each side of the uterus _ and carefully _ and slowly _ lifts

the organ out (Fig. 6189). The advantages of drawing the uterus out of the abdominal cavity before incising it, are the following: – the manipulations about the uterus are easier – the abdominal cavity can be kept much freer of contamination – better manual control of hemorrhage (which is the chief source of immediate danger in cesarean section) – better utilization of uterine contractions – and greater ease in placing the sutures. The disadvantages are the following: – the abdominal incision must be about 5 cm. (2 inches) longer – the general shock is increased somewhat – and the intestines tend to escape from the cavity. (See Fig. 6190.)

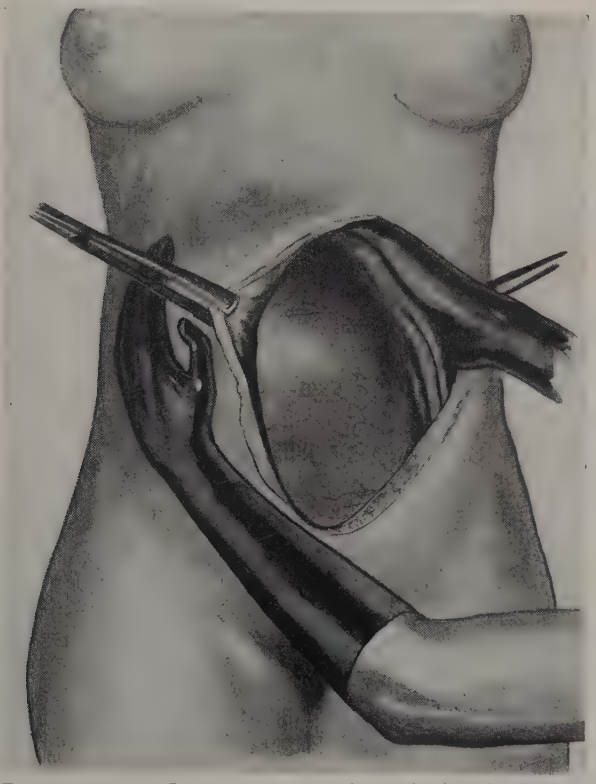


Fig. 6189.—Transperitoneal Cesarean Section – I; – Delivering the unopened uterus through the median abdominal section; – following the retraction of the margins of the abdominal wall, the uterus is being lifted partly out of the abdominal cavity, into the abdominal wound, by means of a hand introduced beneath it, aided by counterpressure from the opposite hand applied to the outer side of the abdominal wall. (Figs. 6189, 6190, 6192 modified from Couvelaire.)

If the uterus is to be incised while still within the abdominal cavity, then the features mentioned above, as advantages of delivering the uterus through the abdominal wound, become disadvantages – and the disadvantages, advantages. If the uterus is to be incised *in situ*, any asymmetric position in which it may lie, as to its general axis, is manually corrected – so that the median line of its anterior wall will correspond with the median abdominal section. (See Figs. 6195 and 6196.)

In first delivering the uterus (which should be done slowly, to enable nature to meet the readjustment – and with warning to the Anesthetist to lessen the anesthesia for the moment – until the resulting respiratory disturb-

ance is tranquilized) – the abdominal contents are largely kept within the abdomen by the plugging effect which the displaced uterus exercises – and whatever tendency there may, nevertheless, be for these to escape, is to be controlled by hot-towel packing into the margins, and especially into the upper end of the abdominal wound. Where the uterus is incised *in situ*, greater provision must be made against the escape of abdominal contents – by hot towels, or abdominal pads.

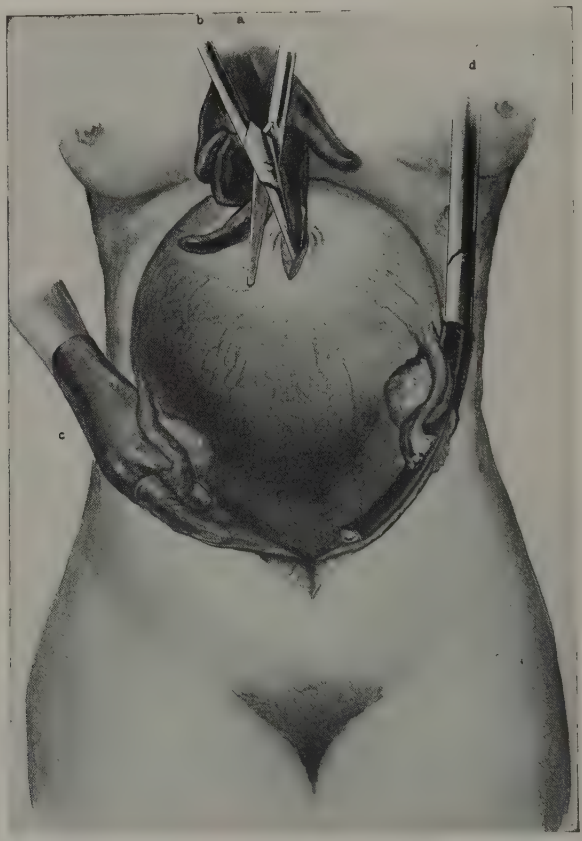


Fig. 6190.—Transperitoneal Cesarean Section – II; – The uterus has been largely delivered through the abdominal section: – a, Finger introduced, through a limited incision of the uterine wall, into the space between the uterus and the membranes – or, perchance, the placenta – as a guide to the further division of the anterior uterine wall; – b, scissors, dividing the uterine wall downward, upon the finger as a guide; – c, control of hemorrhage from the right broad ligament, by compression between thumb and finger; – d, control of the left broad ligament, by rubber-guarded clamp.

In the following description, it will be supposed that the uterus has been delivered outside of the abdominal wound.

In cutting through the abdominal wall, it is to be remembered that the structures of the wall are due to be much thinned out by pressure, and that the cavity will probably be entered much more quickly and readily than under normal circumstances – for which reason care is to be taken that one does not cut directly through the abdominal parietes and into the uterus at one and the first stroke of the knife. There is usually a characteristic bluish-gray glint of the gravid uterus detectable through the peritoneum.

When the uterus has been brought through the abdominal incision, there will, naturally, be an excess of incision, relatively unplugged, or unblocked by the protruding uterus, especially at the upper end of the incision, through which intestines may tend to push their way. This excess of opening must either be packed with abdominal pads – or the opposite margins of the wound may sometimes be seized with non-traumatizing clamps and crossed in opposite directions.

Everything now is ready for the incision of the uterus – in connection with which, and the placenta come as already mentioned, the chief immediate source of danger – hemorrhage. Readiness and provision for this emergency should, therefore, have been made in advance. Considerable bleeding, on incising the uterus, is to be expected – more is to be expected if it happens that the uterine incision falls over the site of the placenta – which it does in more than one-third of the cases. The problem of hemorrhage is usually met in one of three ways: – (*a*) By making no preparation for control of bleeding by special technic, but by simply working expeditiously – realizing that the bleeding will continue until the uterus is empty and contracts, when all serious bleeding will generally cease – and that it cannot contract until it is emptied of its contents, – (*b*) By digital control of the vessels coming into the uterus through the broad ligaments (Fig. 6190, **c**) – accomplished by an Assistant's slipping both hands down along both sides of the uterus from above, and grasping the broad ligaments between the thumb and first finger, or between the first and second fingers, with the palm of his hands toward the uterus; – (*c*) By clamp control of the broad ligament vessels entering the uterus (v. Fig. 6190, **d**) – using non-traumatizing, rubber-covered clamps. It is to be remembered that all methods which cut off the blood-supply to the uterus, also cut off the circulation to the child.

The incision through the anterior uterine wall (which is usually from 14 to 18 cm., or 5½ to 7 inches) should be made exactly in the median line – and should begin well over the fundus, and pass forward and downward over the body of the uterus, but should not involve the lower segment of the uterus – that is, it should pass through actively contractile uterine tissue. The uterus is more apt to be torn in the manipulations of delivery when the incision is carried into its lower segment – the bladder is more apt to be injured – and the lower, larger branches of the uterine vessels are cut. It is well to first make a limited incision through the uterine wall, over the fundus, by knife – and then continue the incision by round-pointed scissors, one blade of which is inserted into the incised wound, guarded and directed by the Surgeon's index-finger introduced beneath it, during the enlargement of the uterine section (Fig. 6190, **a** and **b**).

The incision is made carefully, but boldly, directly through the uterine wall – during which hemorrhage is to be expected – and the best method of controlling it, at this stage, is to apply gauze pressure on each side of the incision – compressing the margins of the uterine wall against the uterine contents, as it were (Fig. 6191). This incision, after passing through the wall of the uterus, will come down upon one of two structures – the membranes or the placenta. If, fortunately, the membranes lie directly beneath the incision, which is carefully deepened into the uterine cavity, these will begin to bulge into the uterine wound, as the last thickness of uterine tissue is cut. It is desirable that they be recognized – and not prematurely cut, with consequent gush of amniotic fluid. It is better to first recognize them, and then carrying two fingers on ahead of the scissors, between the membranes and the inner aspect of the uterine wall, to divide the uterine wall the desired length – after which, the membranes are divided, and the child extracted. If, on

the other hand, the membranes are incised upon, and actually cut through, before being recognized, or, at least, before being separately incised _ as often happens, and is of no consequence _ then one simply expeditiously increases the incision, further dividing the membranes, and delivers the child _ after which the placenta and membranes are delivered.

If, unfortunately (but not at all necessarily disastrously), the incision through the uterine wall comes down directly upon the placental implantation, one of three courses is open: _ (*a*) If one land upon what he may consider the margin of the placenta, he may digitally detach this margin of the placenta nearest the uterine incision _ push it aside _ seize the child and deliver it; _

Fig. 6191.—Transperitoneal Cesarean Section _ III; _ Method of controlling hemorrhage from the incised margins of the uterus _ by compression of these margins against the underlying uterine contents, through pads of gauze _ a technic especially applicable when the incision does not overlie the placenta, and the membranes are not ruptured.

(*b*) If he comes down upon what he considers a more central portion of the placenta, in incising the uterus _ or, independently, if he elect to do so _ he may dextrously enlarge the uterine incision, on his finger between wall and placenta, and quickly detach the placenta with his fingers _ deliver it _ and then promptly deliver the child; _ (*c*) Or he may act exactly as he does in placenta prævia _ and this seems to be the most frequently pursued course, and the best _ namely, tunnel directly through the very body of the placenta, with his fingers _ and then his hand _ and seize and deliver the child _ after which the partially detached placenta is immediately removed _ and the uterus massaged until it contracts. In Fig. 6192 is shown a uterine incision which has come down upon part of the placenta which has been detached in

this site, the membranes opened, and the child in the act of being delivered by podalic traction.

The delivery of the child is best accomplished by introducing the hand through the incision in the uterus – seizing one or both feet, and extracting by podalic traction (v. Fig. 6192). As the incision is of the fundus and upper part of the body of the uterus, and as the case is usually one of head presentation, the feet will, as a rule, be found easily accessible to the hand introduced through the incised uterus. The uterine incision should be ample – or be made ample – for the extraction of the child without using force and probably producing laceration. A sectional view of the delivery by podalic version is

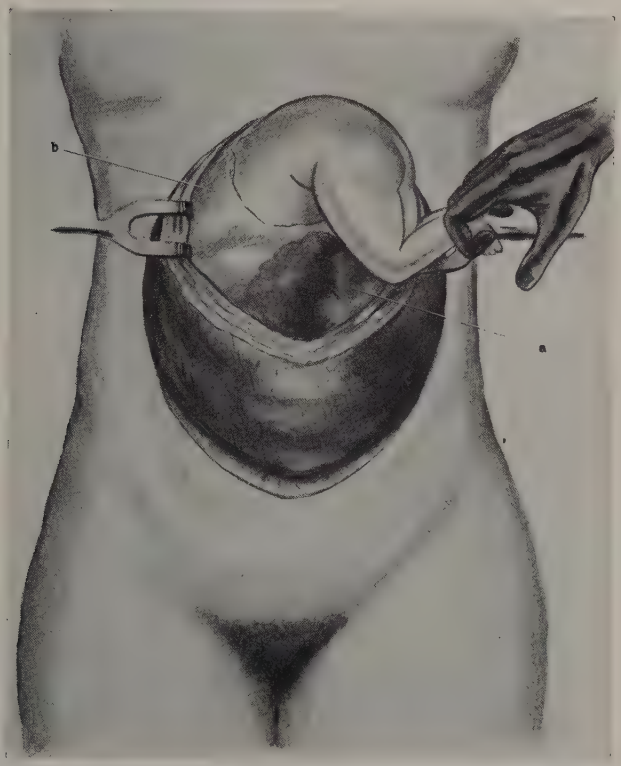


Fig. 6192.—Transperitoneal Cesarean Section – IV; – The uterus, projecting into the wound, has been incised – the uterine margins retracted – the placenta, a, detached, over that portion of its site corresponding with the uterine wound – the membranes, b, ruptured – and the child is in the act of being delivered, by the feet.

shown in Fig. 6193 – in a case where the cause for cesarean section is seen to be a myoma of the cervix. In Fig. 6194 cesarean section has been necessitated by twins, interlocked by head and breech – in which the higher twin is being delivered by podalic traction, through the uterine wound – while the lower twin, whose head is well engaged at the cervix, is being expelled by the natural forces.

Where the case is one in which the lower part of the child's body is presenting at the cervix, and the head lies in the fundal portion of the uterine cavity, then delivery of the child by the head, through the uterine incision, is the general course. This is usually accomplished by applying short forceps to

the head – and if the face lies forward, considerable aid may be given by introducing a finger into the child's mouth (Fig. 6195).

The delivered child is somewhat slower in beginning its repiratory life – probably due to its sudden and unnatural entrance into the world – and if the placenta be still attached, the cord pulsating, and no uterine hemorrhage occurring, one should wait until it cries, before clamping and dividing the cord – though otherwise this may be done at once.

The placenta and membranes are at once removed by hand through the uterine wound following the delivery of the child – and this removal should

Fig. 6193.—Transperitoneal Cesarean Section; – A myoma of the cervix has obstructed the delivery of a normal head presentation – and the child is being delivered by podalic traction, through the medially incised abdominal and uterine walls – seen in partial section – in which the placenta, membranes, and cords are also shown.

be carefully and completely made – and not be so hurriedly done as to be imperfectly done, because of the unusual conditions present (Fig. 6196). The empty uterus is then taken between the hands and massaged, to promote the contraction of its musculature – until which has occurred, there can be no safety from hemorrhage. If the child have been delivered with the uterus within the abdominal cavity, it is sometimes lifted outside of the cavity, after the delivery of the child, both to promote its contraction by massage, and for greater ease of manipulation in the final suturing of its incised wall.

The suturing of the uterine incision is next to be done – forming, with the control of hemorrhage, one of the two most important steps of the operation. The uterus may have to be sutured hurriedly, while still actively and vigorously bleeding – or more deliberately in relative quiescence, as to hemorrhage. In the former instance, the suturing is being performed not only for the purpose of coapting the margins of the uterine wound – but through this coaptation, along with uterine contraction for the purpose of preventing hemorrhage.

In cases of major emergency from hemorrhage, the uterus is seized by an Assistant, in the manner shown in Fig. 6197 – with his fingers and thumb com-

Fig. 6194.—Transperitoneal Cesarean Section; – Delivery of one twin, or both twins, interlocked by head and breech, by cesarean section – seen in section. The second twin may have advanced far enough to be more readily delivered *per vias naturales*.

pressing the upper and lower halves of the incised portion of the uterus, posterior to the margins of the incision, which are thereby brought into two prominent paralled columns. While thus held, a long, straight needle, armed with No. 2 chromic catgut, carries a single tier of interrupted sutures through all the coats (serosa, muscularis, and mucosa) of both margins, at about 1 cm. (6/24 inch) from the margins and about the same distace apart. All are placed while the parts are held as indicated, and before any are tied. Then, beginning at the lower end (from which the supply of the uterine vessels comes), each stitch is tied in turn, relaxing the digital compression of the part before the stitch is tied, so that the opposite cut surfaces can be accurately

Fig. 6195.—TRANSPERITONEAL CESAREAN SECTION; – Delivery of the child by forceps – aided by a finger within the mouth. (Modified from Krönig.)

Fig. 6196.—TRANSPERITONEAL CESAREAN SECTION; – Manual detachment of the placenta and membranes. Forceps, crossed, are temporarily approximating the upper part of the abdominal wall.

approximated and tied, though not with enough tightness to constrict the parts.

A better technic of suturing, if no element of emergency be present, is to insert two tiers of sutures _ which may be continuous, but are better made interrupted _ both of No. 2 chromic catgut. The buried deeper tier, taking in the inner thickness of the uterine wall, without including the mucosa (Fig. 6198, **a**). The outer tier takes in the serosa and the outer thickness of the uterine wall (v. Fig. 6198, **b**). These sutures are most conveniently and rapidly placed by means of a Reverdin needle, while the margins of the uterine wound are held, in turn, as shown in the last illustration.

The wall of the uterus is now wiped off with gauze wrung out in warm normal saline solution _ and all blood-clots are sponged from the abdominopelvic cavity, especially from the uterovesical and uterorectal pouches _ after which, the empty contracted uterus is returned to the abdominal cavity.

Fig. 6197.—Transperitoneal Cesarean Section; _ When hemorrhage is marked, as an alternative to the technic of Fig. 6190, the uterus may be seized by the two hands of an Assistant and its walls approximated and compressed, while interrupted sutures are rapidly placed, penetrating all layers of both margins, including the mucosa, and then quickly tied _ hypodermic injections to promote uterine contraction being simultaneously, or previously, given.

The abdominal wall is then closed in the usual manner _ usually by continous, fine catgut suture of the peritoneum _ No. 2 chromic catgut suture of the aponeuroses and muscles (or the regular overlap technic _ v. p. 111, Vol. IV) _ and silkworm stitches of the skin and connective tissue. The abdominal wall has usually been so thinned by distention in these cases that sometimes (especially in emergencies) the peritoneum is brought together by the first tier of suturing, and then all the overlying structures by the second tier.

The unusually long wound and the relaxed abdominal wall should, after being dressed in the ordinary manner, be snugly, but not constrictingly, supported.

Two weeks should be spent in convalescence.

Comments.—While loops of intestine are less apt to be encountered, immediately upon opening the abdomen, than is usually the case—owing to the displacement of these by the large tumor—yet it is to be remembered that they may sometimes be met between the peritoneum and uterine wall, especially when adhesions are present.

The normal attachment of the bladder to the anterior uterine wall is in the general enlargement and upward displacement of the uterus, naturally drawn upward along with the uterus—and may, through abnormal adhesions, be attached to it additionally high. Under such circumstances, it may become necessary to displace the upper aspect of the bladder by dissection from the

Fig. 6198.—Transperitoneal Cesarean Section;—Closure of the uterine wound;—The uterine margins are steadied by large special forceps, or are held by the fingers. Buried, non-penetrating sutures, approximating the inner half of the anterior wall, excluding the mucosa—and sutures approximating the outer half of the uterine wall, including the serosa—are shown in the act of being placed, by means of a Reverdin needle. The sutures are sometimes made to include the entire wall, except the mucosa, in one layer.

wall of the uterus, to make room for the median incision being carried down the anterior wall of the uterus—in the manner shown in Fig. 6199. At the end of the operation, it is sutured back into place—and may be utilized to partly reinforce the suture line of the uterus (Fig. 6199).

After delivering the unopened uterus through the abdominal incision, the excess of incision at the upper angle of the wound is sometimes brought together by a couple of temporarily applied silkworm sutures—to hold the abdominal contents within the cavity.

The uterus usually tends to lie in a right oblique position—and should be manually straightened, before making the incision into its cavity.

If the membranes are adherent, this is more apt to be in the lower part of the uterus – and are best freed by a finger wrapt in gauze.

The uterus can almost always be made to contract by the combined massaging of its substance, and by the pouring of hot normal saline solution into its open cavity.

The hypodermic use of some preparation of pituitary gland or ergot, administered in advance of the operation, tends to reinforce and strengthen

Fig. 6199.—Transperitoneal Cesarean Section; – The incision of the anterior uterine wall is being carefully extended downward – the bladder being retracted from its adhesions to the lower wall of the uterus. The child's head is seen through the uterine window

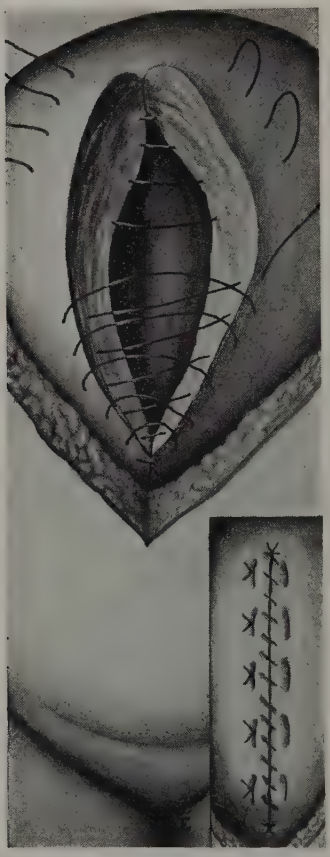
the uterine contractions – which are so essential to the welfare of the case after the expulsion, or removal of the placenta.

The majority of Operators stress the non-inclusion of the uterine mucosa, in whatever method of suturing the organ, may be adopted – while some do not hesitate to include it in the deepest layer of sutures – even when no haste or emergency is present.

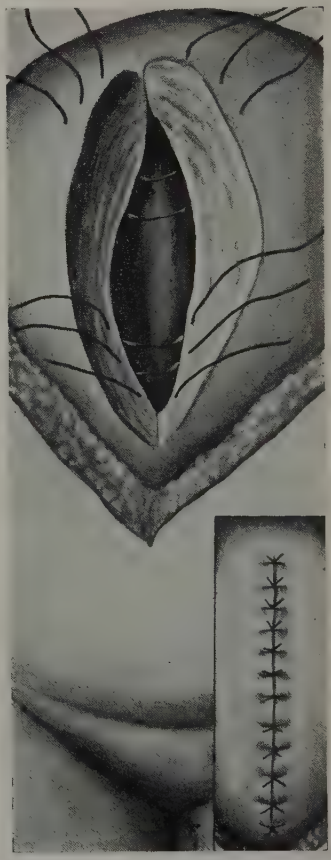
Shears employs three layers of sutures in closing the uterine wound. The lowest tier, uniting the deeper uterine tissue, of medium chromic catgut, is buried and does not include the mucosa – the middle layer, uniting the outer

layer of muscular tissue, is also buried, and of medium chromic catgut and an outer layer of fine chromic catgut through the serosa.

Berkeley and Bonney close the uterine incision with a main layer of about 4 mattress-stitches of No. 4 silk, including the serous and all the muscular coats, but not the mucosa – followed by a continuous marginal stitch of twenty-day catgut of the serosa and adjacent superficial muscular tissue (Figs. 6200 and 6201).



Figs. 6200 and 6201.—Closure of the Uterine Wound – By a tier of mattress-sutures which include all of the uterine wall except the mucosa – followed by a line of continuous suturing of the uppermost plane and margin of the uterine wound.



Figs. 6202 and 6203.—Closure of the Uterine Wound – By a deeper tier of sutures which penetrate the lowermost plane of uterine wall and mucosa – and by a tier of sutures which surround the first tier, and penetrate the entire thickness of serosa, muscularis, and mucosa. Both tiers are placed before either tier is tied. The closed wound is seen in the insert.

Kerr's method of suturing consists of continuous catgut suturing of the mucosa – followed by about five interrupted stitches of "fine silk, as splint sutures" – and the superficial part of the wound closed by a continuous catgut suture, including serosa and superficial muscular tissue. The silk sutures are tied, not too tightly, after the superficial suture is placed.

Couvelaire's method consists of a single layer, non-penetrating suture, of silk.

In Doederlein's technic, interrupted sutures are carried through the entire thickness of the uterine margins – serosa, muscularis, and mucosa.

In Everke's method, interrupted sutures are first carried through all the coats of both margins just as in Döderlein's technic – after which a separate tier of interrupted sutures is carried through the mucosal margins, including a limited amount of the immediately underlying muscularis, and are tied. Finally, the first-placed, through-and-through stitches are knotted.

The line of uterine suturing may be reinforced by bringing the adjacent uterine surface over it, by means of Lembert-type sutures.

In those cases in which after incising the uterus, it is found that the head is the most available portion of the child for first delivering, but does not lie in a favorable position either for being grasped by forceps, or for being digitally

Fig. 6204.—Transperitoneal Cesarean Section; – Converting a lateral presentation of the head, in relation to the uterine incision, into a face presentation – by drawing the face forward by means of a finger introduced into the mouth – preparatorily to delivering the head with forceps. (Redrawn from Krönig.)

drawn from the uterus, a better position of the head may often be secured by inserting the hand part-way into the uterus and, introducing a finger into the child's mouth, as a hook, exercising traction to bring the face forward – as indicated in Fig. 6204.

A method sometimes practised to control excessive hemorrhage, somewhat different from that already pictured (v. Fig. 6197), is to surround the neck of the uterus by the thumbs in front and the fingers behind – completely encircling the organ, belt-fashion, and compressing the broad ligaments against the uterus (Fig. 6190). This technic also brings the uterus well forward for manipulations.

Even if the child be delivered from the uterus while the incised organ is lying within the abdominal cavity, the uterus brought outside of the cavity before being sutured – in order to increase the ease of manipulations.

Instead of incising the anterior wall of the uterus medially and axially, a transverse fundal incision, introduced by Fritsch, has been employed – but presents no sufficiently great advantages to cause it to replace the longitudinal section.

It will sometimes happen in cases where the amniotic fluid has completely escaped that the child will be so tightly held by the uterine walls contracting about it, especially at the contraction ring, that some little difficulty may be experienced in its extraction – and this ring has actually been cut to free it. Manipulation, however, and, if necessary, slight upward extension of the incision, will usually enable the child to be freed.

While incision is made through the upper segment of the uterus by the great majority of Surgeons, it is made through the lower segment by others.

When the placenta is encountered, on cutting through the uterine wall – as it is said to be in 40 per cent. of the cases (Kerr) – and when it is a matter of choice as to whether one cuts, or tears directly through the placenta, or digitally separates it, in order to reach the child, separation is better than cutting or tearing – both because there is less loss of blood to the mother – and less loss to the child.

Unless there be some emergency the cord should not be tied until pulsation ceases – especially if the child be not vigorously alive – as establishment of respiration is longer in taking place than usual, in this unnatural type of delivery.

It is quite as necessary to see that no portions of placenta or of the membranes be left behind as it is after ordinary labor.

Whatever blood and liquor amnii may have escaped into the pelvic cavity, they are carefully removed by sponging, or by suction-drainage, before closing the abdominal wound.

In desperate emergencies, the abdominal wound may have to be closed by a double – or even a single layer of sutures.

The uterine incision for the delivery of the child should be amply large to avoid the necessity of dragging it through an opening whose limits the act may lacerate.

It must never be forgotten that sepsis, prior to or after operation, is to be most strenuously guarded against – as having ultimately defeated, in death, many a brilliantly executed surgical exploit.

In suturing the uterine wound, in those cases where the section is made directly down upon the placenta, separate suture of the mucosa is difficult – the stitches having to be placed a little further lateral to the margins of the wound than usual.

In order to promote the contraction and retraction of the uterus immediately after section and delivery the hypodermic use of preparations of ergot, or of pituitrin, is very generally employed.

Throughout all manipulations, operative and otherwise, it is particularly desirable that the vaginal tract be at no time invaded – either from below, or from above – as it is never sterile. Nevertheless, this general rule is frequently violated.

The uterus is sometimes so badly lacerated in the delivery of the child – usually through too small an opening – that the entire organ must be removed, following delivery.

Massaging the emptied uterus, while surrounded with a hot towel, will promote contraction.

The danger of wounding the bladder, from its occasional unusually high position in the abdomen, must not be overlooked. Davis relates finding the bladder, even though previously emptied by catheter, in marked deformity of contracted pelves, within 2.5 cm. (1 inch) of the umbilicus.

CESAREAN SECTION, BY THE EXTRAPERITONEAL ROUTE

Description.—In this type of operation, the abdominal wall is incised down to the peritoneum _ the cutting and tearing of which is henceforth carefully avoided _ the incision of the uterus and the delivery of the child being accomplished extraperitoneally. The general method of accomplishing these ends, is through the displacement of the bladder to one side, and the upward displacement of the unopened peritoneum.

Two general types of incision are employed _ the transversely curved, suprasymphyseal incision, followed by separation of the muscles in the median line _ and the median incision of skin, fascia and muscles. (In a third, less

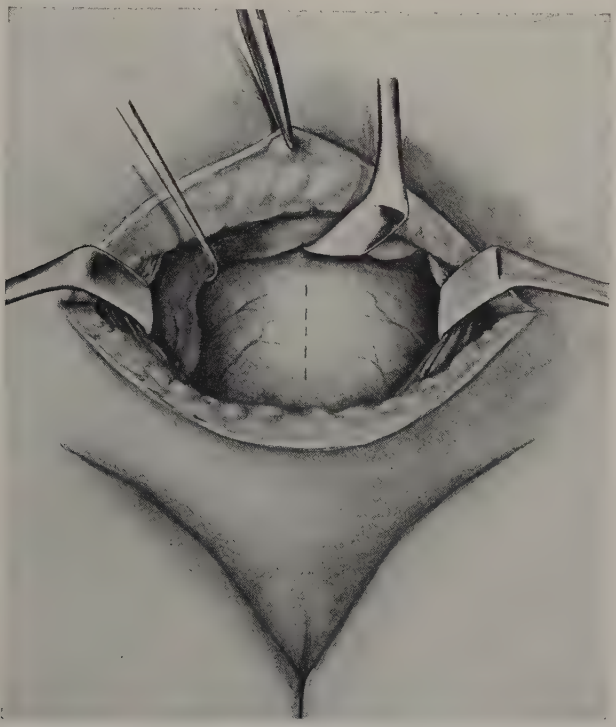


Fig. 6205.—Cesarean Section, by the Extraperitoneal Route _ Through a Transversely Curved, Suprasymphyseal Incision _ Latasko-Döderlein _ I; _ Raising the suprasymphyseal flap _ incising the aponeurosis in the middle line _ and retracting the pyramidales and recti. The line of uterine incision is dotted. The bladder is being retracted outward. The peritoneal reflection is drawn upward The portion of the uterus in the field is the lower segment and neck.

desirable, type of procedure, part of the abdominal musculature itself is divided transversely, and subsequently repaired.)

The operation was especially devised to lessen the dangers of peritoneal infection, where infection of the passages already existed at the time of operation. The operation was also supposed to have the following advantages: _ to bring the section of the uterus more directly over the presenting head _ and to do away with subsequent adhesions of intestine and of omentum to the uterine wound.

The technic is distinctly inferior to the classical cesarean section by the transperitoneal route, through a median abdominal incision _ as being much more dangerous to both mother and child _ and more difficult for the Surgeon

The procedure about to be described is carried on, throughout, extraperitoneally. But the transperitoneal technic can be carried out through the same abdominal incision, after exposing and opening the peritoneum _ though with the same objections as just mentioned. Several methods will be described _ of which the first is more generally used.

Cesarean Section, by the Extraperitoneal Route _ Through a Transversely Curved, Suprasymphyseal Incision _ Latzko-Döderlein Technic.

Preparation _ Position _ Landmarks _ Anesthesia.—As in cesarean section by median transperitoneal abdominal incision (v. p. 762).

Operation.—The skin incision is, practically, that practised in the Pfannenstiel abdominal section (v. Vol. IV, p. 131). It is sometimes described as being

Fig. 6206.—The Same _ II; _ Delivery of the child, by the head.

more parallel with Poupart's ligaments. Having retracted upward the flap of skin and fascia, the median aponeurotic line is divided, from immediately above the symphysis pubis, upward. The inner borders of the pyramidales and recti are then retracted outward _ exposing the subserous areolar tissue, and anterior wall, the apex of the bladder, and the lower peritoneal reflection (Fig. 6205).

By means of a gauze-covered finger, the bladder is displaced to the right _ as far as possible by blunt dissection _ though some of the left lateral ligaments of the bladder may have to be cut _ the bladder being finally detached from the cervix uteri, and held well to the right side of the wound, out of harm's

way, by retraction. The lower peritoneal reflection is recognized – and is retracted well upward. In proportion as these two structures are retracted, will the anterior aspect of the lower segment of the uterus be exposed.

An incision is now made through the anterior wall of the lower uterine segment and neck – the membranes ruptured, and the child's head delivered – either through pressure applied to the sides of the uterus until the head is extruded sufficiently to be grasped (Fig. 6206) – or by means of forceps – or a

Fig. 6207.—Cesarean Section, by the Extraperitoneal Route, by Median Abdominal Section; – Incising the uterus. The bladder is retracted downward and to the right. The unopened peritoneal reflection is displaced upward (toward the umbilicus, in the Trendelenburg position).

foot may be seized. The placenta and membranes are delivered in the usual way.

The uterine wall, which is relatively thin in the lower segment and neck, is sutured by continuous catgut suture. The peritoneal reflection and the bladder are restored to their position – the latter being anchored in position by a catgut suture or two if its ligaments have been temporarily divided.

In infected cases, drainage is sometimes established through the partly sutured uterus – the drain coming out through the suprapubic region. When the need for drainage has ceased, the drain is withdrawn, and the wound allowed to heal.

Comments.—For comments upon the extraperitoneal method, in general, see Cesarean Section by the Extraperitoneal Route, through a Median Abdominal Incision, p. 777.

Cesarean Section, by the Extraperitoneal Route – by Median Abdominal Incision – Döderlein.—The skin, fascia, and median aponeuroses are divided in the median line, from the symphysis upward, to within from 5 to 7.5 cm. (2–3 inches) of the umbilicus – but only down to the peritoneum, carefully avoiding its penetration. The manipulations from this point onward, are practically the same as those already described under the extraperitoneal operation by the transversely curved suprasymphyseal operation. The bladder is displaced toward the right (Fig. 6207) – temporarily severing some of its left lateral ligaments, if necessary – so that it may be detached from the cervix and held well away from the median line. The reflection of the perito-

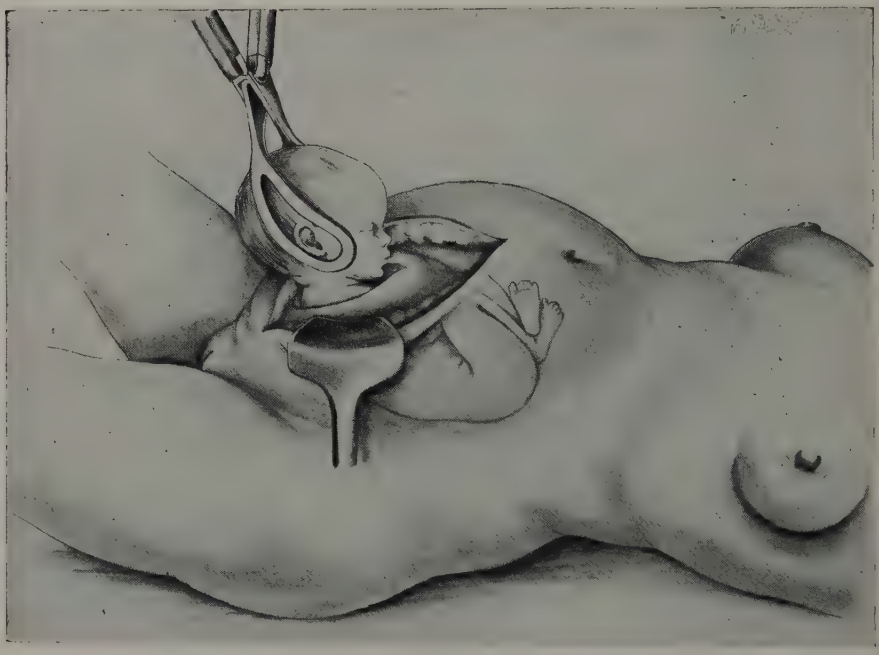


Fig. 6208.—The Same – II; – Forceps extraction of the child.

neum onto the anterior wall of the uterus is recognized – and the peritoneum carefully separated from the front of the lower segment of the uterus by a gauze-covered finger – and retracted well upward. When the surface of the uterus has been sufficiently cleared of peritoneum, the anterior wall of its lower segment and neck are incised in the median line – the incision being made with great care, owing to the thinness of the uterine wall in this locality – and the child delivered, either by expression through lateral compression of the abdominal wall, or by extraction. The disposition of the parts and the position of the uterine incision, are shown in Fig. 6208.

Cesarean Section, by the Extraperitoneal Route – Through an Inguinal Incision – Döderlein.—The patient lies in the Trendelenburg position. An incision is made parallel with, and just above Poupart's ligament, usually of the right side (Fig. 6209). This incision passes, first, through skin and fascia

– and the superficial epigastric vessels are doubly ligated and tied. The muscular aponeuroses are then divided in the same line. The rectus muscle itself is not cut – but retracted well mediad. The margins of the external oblique and internal oblique and transversalis are divided – the division extending outward, along the line of the original incision, as far as necessary. The deep epigastric vessels are doubly ligated and divided, in the transversalis fascia, between the transversalis muscle and peritoneum. The peritoneum is recognized – and carefully displaced, unopened, in an upward direction. The bladder is displaced toward the median line. If the round ligament blocks the field, it is doubly ligated and divided – or drawn aside. The lower, anterolateral aspect of the uterus now lies exposed. The appearance of the field, unencumbered by retractors, is as seen in Fig. 6209. While manipulating in

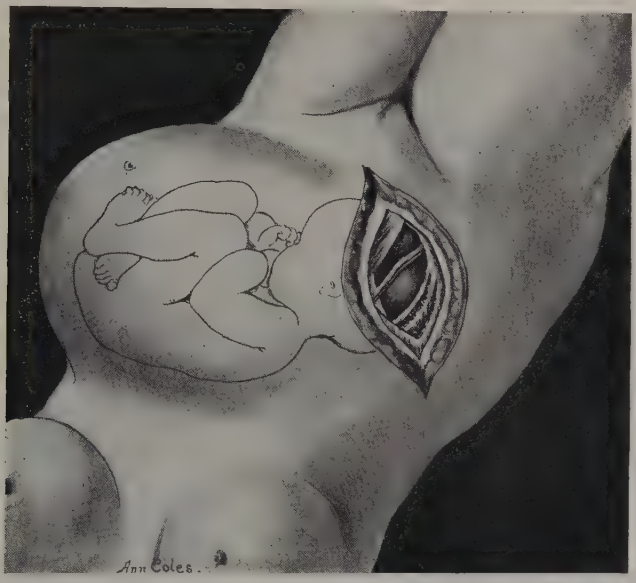


Fig. 6209.—CESAREAN SECTION, BY THE EXTRAPERITONEAL ROUTE – THROUGH AN INGUINAL INCISION – I; – The incision is made with the patient in the Trendelenburg position. In the exposed field, the superficial and deep epigastric vessels are doubly ligated and divided. The rectus is retracted mediad, and the incised external and internal oblique, laterad. The bladder is drawn mediad – and the unopened peritoneal reflection is displaced upward.

the parametrial connective tissue, one should be on the lookout against damaging the ureter – which, though, is unlikely.

The freeing of the unopened peritoneum from this aspect of the uterus is generally considered easier than to do so in the median aspect. The section of the uterus is made about 3 cm. ($1\frac{1}{3}$ inch) to the outer side of, and parallel with, the retracted bladder. If this aspect of the uterus be occupied by the child's head, the incision may be made at any time – but if occupied by some other part, the incision through the uterine wall (which is rather thin in this region), is more easily made during a pain which stretches the uterine wall somewhat tautly over the part. The patient is now lowered – the membranes ruptured – and the child, if presenting by the head, is usually delivered by forceps (Fig. 6210) or, if some other part present, usually by the introduction of a hand into the uterus and the seizure of a foot. It is to be remembered that these manipulations are being carried on through unusually small space

—and that every care must be used to avoid rupturing, or even lacerating the uterus. If damage of this sort be done, it must be repaired by suture—or the uterus removed.

After removing the placenta and membranes, the uterine incision is sutured—the technic usually being simpler in this position than where the wall is thicker. The incised muscles of the abdominal wound are repaired by suture—and the wound closed in the usual manner.

Prior to suturing, drainage is sometimes established through the cervical canal—a strip of gauze—but with the exposure from the vagina which this must entail.

Comments Upon Extraperitoneal Cesarean Section.—The basal idea in extraperitoneal cesarean section—as of most extraperitoneal types of operation—is the avoidance of infecting the peritoneal cavity—and its chief field of application was in those cases in which infection was already existent in some part of the parturient tract.

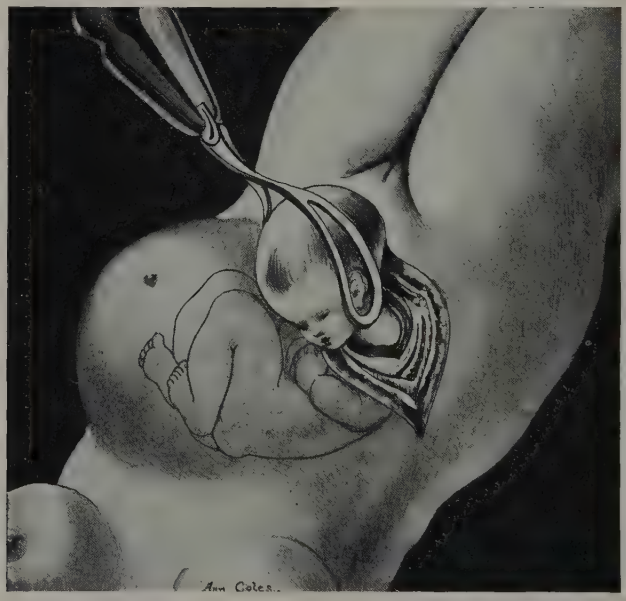


Fig. 6210.—The Same—II;—Delivery of a head presentation, by forceps.

The approach for the extraperitoneal type of operation is sometimes made by incision carried parallel with Poupart's ligament, cutting through the skin, fascia, and muscles of only one side, from symphysis to iliac spine—which gives an even more cramped approach than the Pfannenstiel type of incision. The exposed uterus is then entered through its anterolateral aspect.

The child is expelled, if possible, by expression, by means of lateral compression applied through the abdominal wall. It is desirable to similarly express the placenta and membranes.

There is great danger of wounding the peritoneum—and the essential part of the operation—its extraperitoneal feature—is, therefore, very frequently entirely lost, through this tearing of the peritoneum. Further, the uterus is often lacerated, in traction of the child through a so relatively small opening. The bladder is often injured. And severe hemorrhage has occurred from the

relatively large branches of the uterine vessels encountered in the lower segment.

Sellheim's operation, while usually described among the extraperitoneal operations, is, in its early stage an intraperitoneal technic. The abdomen is opened _ down to the peritoneum _ by the Pfannenstiel type of incision, except that it is more transverse. The vesical peritoneum is removed, unopened, from the posterior aspect of the bladder, by blunt dissection, as far down as possible _ and is then transversely divided, thereby opening the peritoneal cavity. The peritoneum is then transversely divided where the vesical peritoneum is reflected upward onto the anterior aspect of the uterus _ the two transverse peritoneal incisions uniting laterally _ after which, the uterine peritoneum is freed upward, by blunt dissection, from the anterior uterine wall. The margins of the visceral layer of peritoneum, from the anterior uterine wall, and that of the parietal layer, are now sutured together, from one lateral angle of the peritoneal incision to the opposite _ thus shutting off the general peritoneal cavity. The lower segment and neck of the uterus are then divided in the median line, just as in the typical extraperitoneal operation _ and the child withdrawn.

CESAREAN SECTION, BY THE VAGINAL ROUTE

Description.—The delivery of the child through a temporary vaginohysterotomy incision, without invading the peritoneal cavity _ after which, the incisions are sutured.

The procedure may be carried out through a single median incision of the anterior vagino-uterine wall _ or the maximum approach may be secured through combined median incisions of both anterior and posterior vaginouterine walls. The former method will generally suffice when a moderate opening in the later, but not latest months, is required _ and the latter, when the largest opening is needed.

The general bearings of the subject are treated of under Cesarean Section, in General, p. 760.

Preparation _ Position _ Landmarks _ Anesthesia.—As for vaginoperitoneotomy, by the anterior, or posterior route (v. pp. 372–380) _ there being much in common in the operations, up to the exposure of the peritoneum. The bladder and rectum are both emptied.

Vaginal Cesarean Section, by Anterior Vaginohysterotomy.—The early steps of this operation are very similar to those of anterior vaginoperitoneotomy, or anterior vaginal celiotomy (v. p. 372). The technic is especially suitable for a small uterus, not advanced to full term. The posterior vaginal wall _ the patient lying in the dorsal gynecologic posture _ is retracted by a posterior vaginal retractor, hand-held, or weighted. The anterior cervical lip is seized by two tenaculum-forceps, one to either side of the median line. In addition, two stout silk ligature-tractors are placed through this lip, each to the outer side of the metal tractor, to be ready for use when the former are withdrawn and all available room is needed. An inverted T-shaped incision is now made _ the transverse portion passes half-way around the cervix, upon its anterior aspect, and just below the level of the bladder. The vertical incision is median, and begins just below the urinary meatus, and ends at the center of the transverse incision. These incisions pass through the mucosa, into the connective-tissue plane. The two lateral flaps, right-angled below, are separated laterally in this plane, and held retracted to either side. The lower limit of the attachment of the bladder to the uterine cervix is recognized _ and carefully separated and pushed upward by blunt dissection.

This separation should be very thorough, and extend well above the uppermost limit of the intended uterine section. With the bladder and the lateral vaginal flaps well retracted, and the cervix being drawn upon by the thread-tractors, which are now alone in place, after the removal of the metallic tractors, the anterior wall of the bared cervix is centrally divided with stout, round-pointed scissors – the incision being carried far enough upward to make an opening large enough to enable the hand to enter the uterine cavity.

The protruding membranes are ruptured – the hand introduced and a foot seized and brought down, and the child delivered – or the child may be delivered by forceps (Fig. 6211).

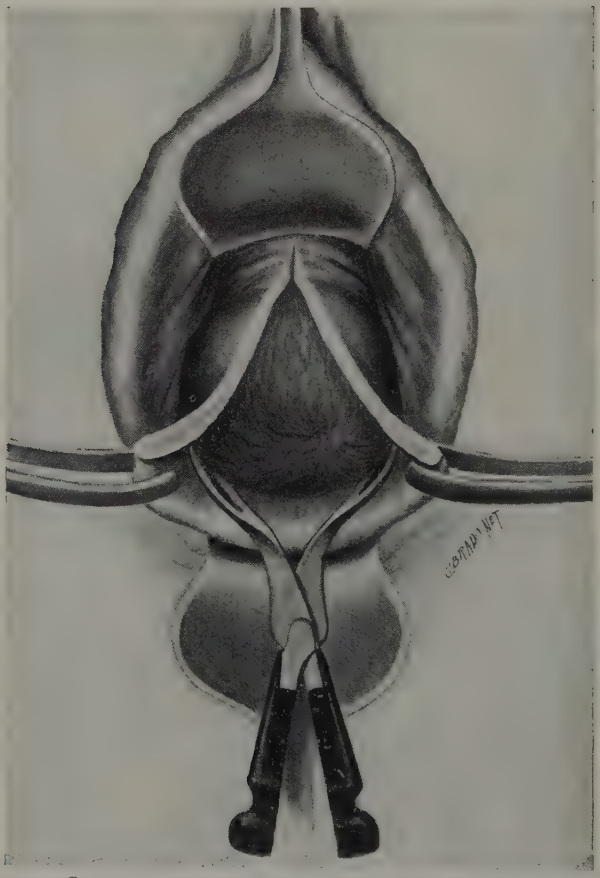


Fig. 6211.—Cesarean Section, by the Vaginal Route, Through Anterior Vaginal Hysterotomy; – Delivery by forceps, introduced through the vaginohysterotomy incision.

Upon the completion of the operation, the parts are restored by careful suturing – which is here much simpler than in the following technic. The uterine canal is repaired first, by a tier of buried catgut sutures, which penetrate the uterine mucosa of the vertical wound – and then a second tier, which penetrate the vaginal mucosa of the vertical wound – after which, the transverse wound is sutured.

Vaginal Cesarean Section, by Combined Anterior and Posterior Vaginohysterotomy – Duehrssen.—The maximum space for manipulation

and delivery is secured by medially dividing both the anterior and posterior cervical walls, including the lower uterine segment, through their vaginal aspects. The operation is conducted throughout extraperitoneally.

The patient is in the dorsal decubitus, with a posterior vaginal retractor in place. The cervix is seized by two laterally placed vulsellum-forceps. Unless these be of a special type which will not, in the later manipulations block the way, strong silk-tractors are, in addition, carried through the lips – to be used when the forceps are withdrawn.

If there be any question as to the vaginal space – and especially in primiparæ, with small vaginæ, a left vaginoperineal incision is made, temporarily

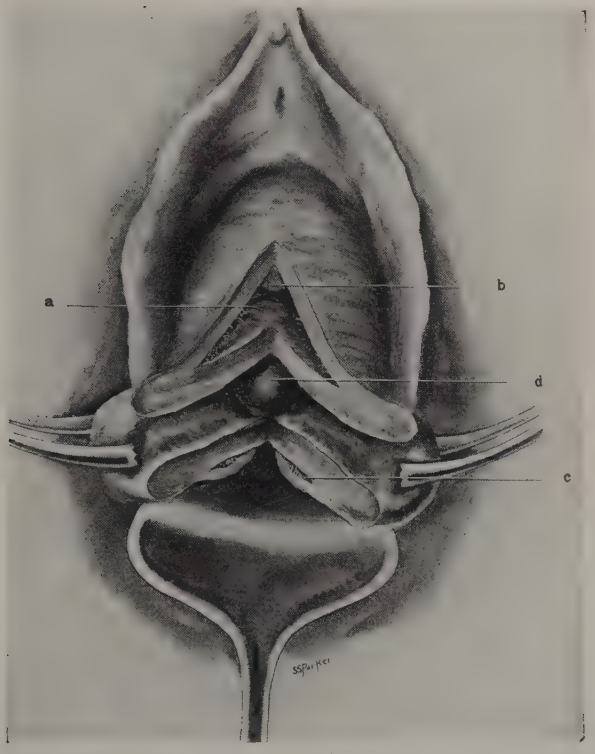


Fig. 6212.—Vaginal Cesarean Section, by Combined Anterior and Posterior Vaginohysterotomy – I; – The lips and neck of the uterus have been divided in the middle line, anteriorly and posteriorly, and retracted laterally: **a**, Anterior vaginal fornix, opened – through which the bladder, **b**, is safeguarded by being pushed upward; – **c**, posterior fornix, opened – through which the rectum is guarded; – **d**, distending membranes. The posterior vaginal speculum is in the vagina, ready to be transferred into the opening through the vaginal fornix.

cutting the vaginal constrictor and the levator ani – sufficiently to allow the closed fist to be carried into the vagina. Visibly bleeding vesels are at once clamped and tied – and the rest of the bleeding will usually be controlled by the pressure of the retractor carried into the wound thus made. In the present description, this degree of opening, by vaginoperineal section, will not be considered necessary.

The cervix is drawn by the tractors, while anterior and posterior vaginal retractors hold the parts away, and the posterior lip is medially divided, the incision being carried about 2 cm. ($\frac{3}{4}$ inch) through the fornix with stout

round-ended scissors, up to the dome of the posterior vaginal fornix. A finger is carried through the fornix and the recto-uterine peritoneal reflection is pushed off the posterior uterine wall, and displaced upward. The posterior retractor is now slipped from the vagina, through the incised posterior fornix – and holds the peritoneum upward and away from the posterior uterine wall. This fornix may be split even up to 4 cm. ($1\frac{9}{16}$ inch).

The cervix, still drawn upon, is now depressed, and the anterior cervical lip is similarly divided in the median line – the incision passing through about 5 cm. (2 inches) of the anterior vaginal fornix (Fig. 6212). As was done posteriorly, a finger is carried through the incision in the anterior fornix, and the

Fig. 6213.—The Same – II; – The on-coming head is seen distending the cervico-uterine outlet – which can be still further enlarged by continuing the incisions through the anterior and posterior uterine walls, as indicated by the dotted lines. Retractors are seen passing through the opened anterior and posterior vaginal fornices, into the connective-tissue spaces beneath the floors of the unopened vesico-uterine and recto-uterine peritoneal pouches. The unopened peritoneum is seen just above the lower, and just below the upper, retractor.

vesico-uterine peritoneal reflection separated laterally and upward – from the anterior uterine wall, behind, and from the bladder, in front. A few guarded scissor-snips, with Mayo scissors, may aid in separating the peritoneum from the bladder, especially laterally. Then, as was done posteriorly, the anterior vaginal retractor is slipped through the incised anterior fornix – and henceforth holds the detached peritoneum away from the uterus.

In this way, about 6 cm. ($2\frac{6}{16}$ inches) of the anterior and posterior cervico-uterine walls are exposed – and from which the peritoneum has been displaced by the retractors (Fig. 6213). If it be indicated to continue the uterine incisions upward, this may be done along the dotted lines.

The membranes usually protrude through this large opening, and are rup-

tured. A hand is then generally at once introduced and, seizing a foot, brings about version _ and delivery. The placenta and membranes may be expelled spontaneously, or may require to be delivered by hand. Delivery of the child is sometimes accomplished by forceps (v. Fig. 6211).

At the end of the operation, the incised structures are carefully repaired by suture (Fig. 6214). The margins of the posterior uterine wall are first brought together _ next the margins of the posterior vaginal incision, through the posterior fornix. Then the margins of the anterior uterine wall are united _ and, finally, the margins of the anterior vaginal incision, through the anterior fornix. Last of all, the vaginoperineal incision, if one have been used, is repaired.

Vaginal Cesarean Section, by Combined Anterior and Posterior Vaginohysterotomy _ Aided by the Metreurynter _ Duehrssen.—The use

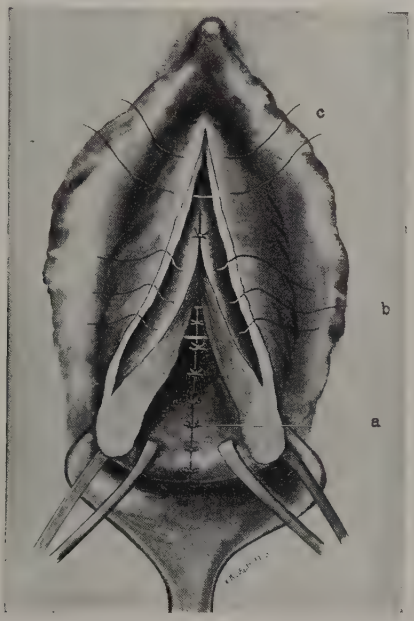


Fig. 6214.—The Same _ III; _ Repair of the uterovaginal wounds: _ a, Suture of the posterior median uterine wall _ (the closure of the posterior subperitoneal space, that is, the incised posterior vaginal fornix, Fig. 6213 is not here visible); _ b, closure of the medially divided anterior uterine wall; _ c, suturing of the anterior vaginal wall, closing the anterior subperitoneal space, thereby closing the anterior vaginal fornix.

of the metreurynter may have been begun as an aid in vaginal cesarean section _ and, through the dilatation accomplished, be found to suffice for the delivery. Under such fortunate circumstances, no division of the parts is made.

The collapsed rubber bag is introduced into the uterus _ and then filled with sterile solution (Fig. 6215). Distention by the bag is given time to enlarge the cervical opening _ and then increased distention _ and, finally, traction. A satisfactory degree of dilation for delivery may occur _ and, if so, well enough. If not _ and while continuing to practice traction _ a transverse incision, nearly half encircling the lower aspect of the cervix, is made upon its anterior face _ and to this a median vertical incision is added, from just below the urinary meatus. Two lateral angular flaps are raised from these

incisions _ in the same general way as already described in connection with vaginal cesarean section, by anterior vaginohysterotomy (v. p. 783). These vaginal flaps are separated from the uterus, in the connective-tissue plane. The attachment of the bladder to the cervix is detached by blunt dissection, and displaced upward _ where it, and the vesico-uterine peritoneal reflection, are held out of the way by a retractor passing through the incision in the anterior fornix. The anterior uterine cervix and lower segment are then divided in the median line by stout, round-pointed scissors _ as far upward as may be thought necessary (Fig. 6216). The bag may then slip out _ and the opening accomplished by the combined distention and incision may suffice.

When the metreurynter is so firmly held that it is not released after the anterior splitting of the uterine neck, it is generally indicated to bring the bag

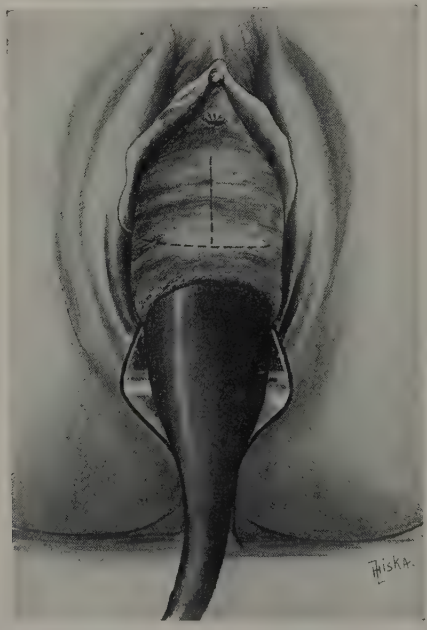


Fig. 6215.—Use of the Metreurynter, as an Aid in Vaginal Cesarean Section _ I; _ Traction upon the introduced and distended metreurynter has drawn the uterus well downward, everting the anterior vaginal wall in its descent. An inverted T-shaped (⊥-shaped) incision is made upon the anterior vagino-uterine wall.

forward _ continuing traction _ and then medially incise the posterior aspect of the uterine neck, as far upward as necessary (Fig. 6217), but first cutting through the posterior vaginal fornix with care, and recognizing and displacing the recto-uterine peritoneal reflection out of harm's way.

Ample room is thus usually secured for delivery _ which is accomplished spontaneously, manually, or instrumentally _ the child, placenta, and membranes being delivered _ and the parts repaired by suture.

Comments.—These methods are usually successful in cases where the conjugate diameter is at least 7.5 to 8 cm. ($2\frac{15}{16}$–$3\frac{2}{16}$ inches).

Some hypodermic preparation of ergot or pituitary gland is given in advance _ to secure its aid in emptying the uterus and retaining its contraction.

If the postpartum uterus does not show a tendency to contract, it is packed with gauze.

It is well to introduce a small temporary drain into wounds in both the anterior and posterior vaginal fornices.

The division of the uterus is carried as short a distance as possible above the internal os.

In dealing with a large child, Duehrssen stresses the use of the added vagino-perineal incision.

Fig. 6216.—The Same _ II; _ Incising the anterior uterine wall; _ the bladder has been displaced upward and is held out of the way by a retractor inserted into the uterovesical connective-tissue space, through the ⊥-shaped incision.

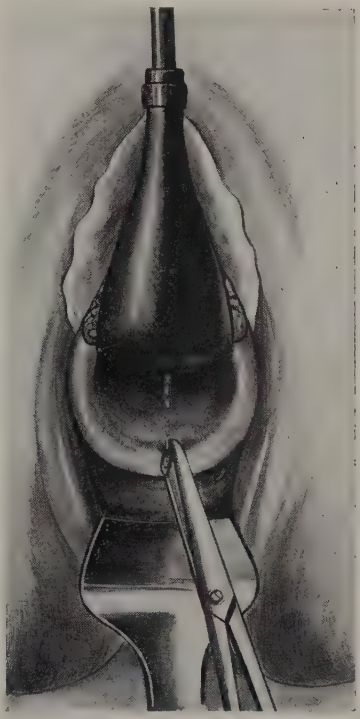


Fig. 6217.—The Same _ III; _ Incising, when necessary, the posterior uterine wall; _ the metreurynter is now drawn upward and forward, toward the symphysis, and the posterior uterine wall is incised as indicated in the dotted line. Having continued the posterior incision upward and displaced the rectum, here shown, the posterior vaginal fornix is removed, and placed (correspondingly with the anterior one) into the utero-rectal connective-tissue space.

The combined splitting of both the anterior and posterior aspects of the uterine neck make rupture of the uterus, during delivery, less likely than where just the anterior splitting is done.

In malignancy of the uterus _ and often in sepsis of the uterus, the organ is usually entirely removed, vaginally, directly after delivery.

SYMPHYSIOTOMY AND PUBIOTOMY _ FOR TEMPORARILY INCREASING THE PELVIC MEASUREMENTS IN DELIVERY _ IN GENERAL

Symphysiotomy _ division of the pubic joint in the median line _ for temporarily increasing the diameters of the pelvic bony girdle (Fig. 6218, **a**).

Pubiotomy _ division of the pubic bone to one side of the median joint _

usually in one site (sometimes in more) – to secure temporary enlargement of the bony girdle (v. Fig. 6218, l).

In performing pubiotomy, one of two incisions is usually adopted; – Gigli's incision is the one most frequently employed (v. Fig. 6218, l), passing obliquely downward and inward, from just outside of the pubic tubercle, or spine, to the lower, inner border of the descending ramus of the pubis – while Van der Velde's incision (v. Fig. 6218, m) passes from the margin of the upper border of the symphysis pubis, obliquely downward and slightly outward, to the same point on the lower, inner border of the descending pubic ramus as reached by the Gigli incision. This latter incision runs somwehat less risk of wounding the internal pudic artery, as well as the corpus cavernosum of the clitoris.

Fig. 6218.—Divisions of the Pelvic Girdle, to Temporarily Increase the Diameters of the Bony Inlet: – k, Incision in symphysiotomy (median pubiotomy); – l, Gigli incision in pubiotomy (extramedian pubiotomy); – a and k, symphysis pubis; – b, tubercle; – c, horizontal ramus of pubis; – d, descending ramus of pubis; – e, e, pyramidales; – f, f, recti; – g, clitoris; – h, h, erectores clitoridis; – i, vulval cleft; – j, j, obturator foramina; – m, van der Velde's incision. (Redrawn from various Anatomies.)

Irrespectively of whichever incision be adopted, the crus of the clitoris (cavernous body) is apt to be injured unless it be temporarily displaced to one side by blunt dissection.

Several other forms and combinations of sections have been carried out in performing pubiotomy, such as – double division of the body of the os pubis – division of both the horizontal and descending rami on each side, making four bony sections; – and the combination of median symphysiotomy and bilateral pubiotomy of both the horizontal and descending pubic rami. In such extensive divisions, sometimes carried out in unusual deformities and contractions of the pelvic girdle, too much damage is done to make such technics desirable.

As to the relative merits of symphysiotomy and pubiotomy, considerable controversy has been waged _ with most pronounced views in opposite directions _ and with shifts of allegiance from one technic to another, and back to the original. The most liberal, non-partisan view is, that there is not a very great deal of choice between them _ as to unquestionable predominance of superiority.

It would seem, from embryologic and physical standpoints, that if a girdle be developed by two halves, meeting and welding anteriorly, that the greatest increase in the dimensions of that girth would be gotten _ short of breakage _ by dividing the line of its union, *i. e.*, the symphysis, rather than a portion of the girdle to one side _ and also, that the bending backward upon the sacro-iliac joints to give the added room, would be more safely and fully accomplished thereby. In other words, the median division seems the natural, and the lateral division, the unnatural method.

Indications for either symphysiotomy, or pubiotomy, are _ pelvic deformity _ faulty presentation _ overlarge head, disproportionately large, as compared with the pelvis, or other fetal deformity _ and when the pelvic girdle does not admit of the engagement of the head, either by special position of the mother, or by the use of forceps.

Preliminary requirements, before resorting to either operation, however, are _ that a living, healthy child be present _ presenting by the head _ in a dilated and uninfected parturient canal, having a true conjugate diameter of at least 7.6 cm. (3 inches), and not under 7 cm. ($2\frac{3}{4}$ inches) _ and after forceps have been tried one or more times (the final determining forceps test probably being made in the Walcher position).

Neither operation should be performed unless it be considered that delivery will be possible, either by natural expulsion, or by forceps, after it is performed _ as has sometimes happened. It is of greater importance to wisely select the case for either operation, than it is to decide whether the operation should be a symphysiotomy, or a pubiotomy.

The special indication for these operations are _ that after the unsuccessful application of forceps, it is considered that just the necessary room is securable, which will enable the child to be born, or be delivered _ such as in moderate pelvic obstruction, with no obstruction of the soft parts, and with favorable head presentation of a living child. In other words, either operation is indicated _ other things being favorable _ if it be known that the impediment to birth is simply a limited and removable degree of wedging of the child in the pelvis.

In flat pelves there should be a conjugate diameter of not less than 9.5 cm. ($3\frac{3}{4}$ inches) _ with no disproportional diaparity between the head and pelvis _ with the cervix dilated (especially in primiparæ) _ and with some engagement assured.

If there be marked disproportion between the head and the pelvis, as shown by increased measurements of the former, and decreased of the latter, cesarean section is usually indicated. This is quite different if the relative increase or decrease in both be the same _ leaving the proportional relationship normal.

Cesarean section, in these cases, is safer for the child _ and as safe for the mother. In the presence of conditions, the nature or degree of which are not clear, it solves more problems, from the combined mother's and child's standpoints, than does any other course.

There is a tendency of the newer operation of pubiotomy to replace the older operation of symphysiotomy. It was devised for the purpose of removing the operation from a site where the bladder, urethra, and the venous plexuses were more involved.

Symphysiotomy is more easily and rapidly performed _ is generally considered to open the pelvis more widely _ and to be safer.

The after-treatment of pubiotomy is held to be shorter, simpler _ and the functional results better _ though these, together with the greater safety of symphysiotomy, are denied by others.

The chief sources of hemorrhage during the operation, are _ from the venous plexuses of the vestibule and vagina, the inferior vesical plexus _ the dorsal vein of the clitoris _ and from the internal pudic vessels.

The chief dangers of the operations, are _ damage to the sacro-iliac joints, with involved locomotion _ infection _ hemorrhage _ damage to bladder, urethra, and vaginal vestibule _ and damage by forced delivery.

Some deliver with forceps, immediately after operation _ others wait a reasonable time for expulsion to be accomplished by nature. Less damage is considered likely to be involved, if one waits an hour or two for the head to descend (Bumm) _ rather than risk extensive laceration by the two speedy application of forceps (Bumm).

Delivery is to be favored without forceps _ and without turning.

If forceps be used, axis-traction forceps are usually considered better than ordinary forceps.

Both forms of operation, even the subcutaneous types, constitute a compound fracture _ in an awkward position _ and with all the possibilities for infection.

Union is probably generally fibrous _ and the permanent increase of pelvic girth sometimes noted following operation, is, in all likelihood, due to this.

In all forms of open operation, suturing of the bony, or periosteal parts, and of the overlying soft parts, should always be carried out with, or without drainage, as indicated.

Some form of restraining dressing _ in the form of a pelvic binder or belt _ preferably of some definite and resistant type _ should be invariably applied, and worn, following these operations. It is probably the absence of such supports _ or the result of insufficient ones _ which accounts for the reported ligamentous unions.

Sometimes an excess of callus forms.

The amount of increase in gain following these operations, as measured by the width of the gap between the bone-ends, is usually from 2 to 4 finger-widths. The gain in the conjugate diameter is generally about 1.2 cm., ($\frac{1}{2}$ inch) or more.

The mortality of the mother is said to be about 2 per cent. _ and of the child, about 4 per cent.

All of the usual preparations for operations in this region should be observed. The bladder should be emptied.

The patient should remain in bed for three or four weeks.

Both the symphysiotomy and pubiotomy operations may be carried out by the open, subcutaneous, and combined methods _ the chief forms of which will be here described.

SYMPHYSIOTOMY, BY THE OPEN METHOD

PINARD

Description.—The division of the joint of the symphysis pubis, in the median line, through an open, median incision. Chance is given the child to be born spontaneously, following the section. The structures of the symphysis, and the overlying soft parts, are united by suture, at the end of the delivery _ whether accomplished naturally, or by aid

The features of the various operations, of which this is one, are given on p. 789.

Operation.—This technic is sometimes known as the French operation _ and the method of its performance as here given, will largely conform with the steps carried out by Pinard _ and also those of Farabeuf. An incision, approximately 7.7 to 9 cm. (3–3½ inches) in length, is made in the median line _

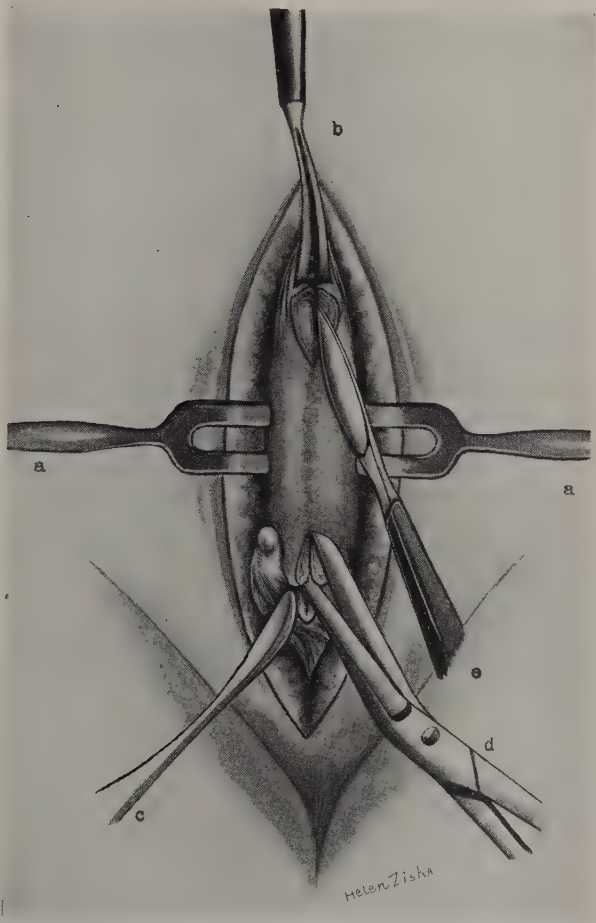


Fig. 6219.—Symphysiotomy, by the Open Method _ Pinard: _ a, a, Retractors of the skin and fascia; _ b, special, curved grooved director, passing closely behind the symphysis pubis, entering between the pyramidales and recti muscles above, and emerging at the subpubic arch below; _ c, blunt dissector, temporarily displacing the clitoris and erectores clitoridis from the subpubic arch; _ e, division of the interarticular cartilage by knife, upon a grooved director, from without, inward, and above, downward; _ d, scissors making the same section, from the opposite end.

extending, through the shaven skin, from above the upper border of the symphysis pubis, down to the middle of the subpubic ligament _ and the base of the clitoris, and then, if necessary, slightly further downward, but deviating immediately to one side of it. The incision is deepened through the connective tissue _ recognizing the dorsal vein of the clitoris and displacing it to one side. In the upper part of the wound the pyramidales and recti abdominales muscles are recognized in the median line _ and their median aspects separated suffi-

ciently, by blunt dissection to give access to the postsymphyseal space of Retzius _ between the posterior aspect of the pubis, and the anterior aspect of the bladder. By blunt dissector, or grooved director, a pathway is tunneled closely hugging the posterior surface of the symphysis pubis, to its inferior border. It is during this portion of the procedure that the bladder must be especially guarded. It is generally possible to carry the finger behind the symphysis. It may be necessary to sever a small part of the attachment of the pyramidales and recti from the pubic bones. The subpubic aspect of the wound is now freed in the path of the intended symphic section. Rather than divide

Fig. 6220.—Farabeuf's Grooved Symphysiotomy Protector.

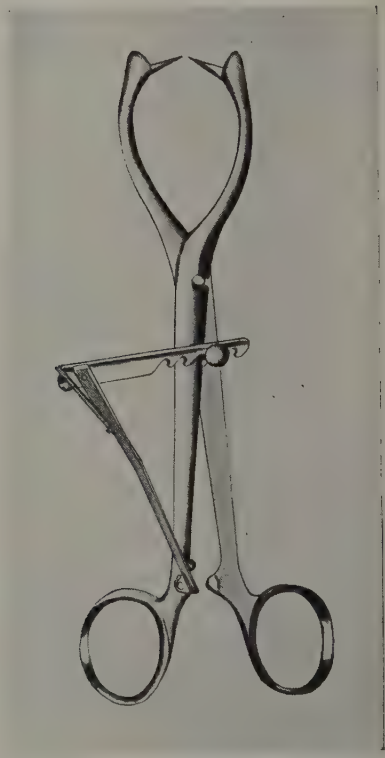


Fig. 6221.—Farabeuf's Symphysis Gage and Compressor; _ with rachet, to gage and control the amount of separation of the symphysis occurring, after division _ and for holding the pubic bones together during the application of sutures.

the suspensory ligament of the clitoris, it should be displaced to one side by blunt dissection, out of the line of knife-cut (Fig. 6219). The grooved director, or blunt dissector then, in turn, clears a way upward, behind the symphysis, from the lower end of the opening. Retracting the margins of the overlying-soft parts, and protecting the tissues behind the symphysis, by spatula, or grooved director, the symphysis is divided exactly in the median line, from its anterior aspect _ preferably by knife _ though sometime by stout, blunt-pointed scissors. Just prior to completing the section, Assistants should steady the thighs, to keep them from rolling too far outward, in their natural outward

gravitation – for the maximum separation of the symphysis joint should not be allowed to become more than 6.3 cm. ($2\frac{1}{2}$ inches). A sound in the bladder may be of use in safeguarding the urethra. If greater separation is required than immediately follows the median section of the joint, some of the immediately adjacent ligamentous structures, directly beneath and behind the symphysis may have to be further carefully divided. The subpubic triangular ligament is usually cut. The more closely the posterior aspect of the symphysis is hugged, in bluntly dissecting through the space of Retzius, the less will be the bleeding from the venous plexuses. Farabeuf's grooved symphysiotomy protector, is seen in Fig. 6220.

When the barrier to the widening of the pelvic girdle has been thus removed, the wound is carefully protected with sterile gauze dressings, held in place by strips of zinc oxid plaster. The amount of interval between the inner ends of

Fig. 6222.—Suturing the Divided Symphysis Pubis, at the Completion of Open Symphysiotomy– while the parts are being held together by forceps-coaptator.

the pubic bones is controllable, and determined by the amount of abduction and outward rotation of the thighs, and *vice versa*. The amount of this separation is registered by Pinard's instrument, attachable to the pubic bones – or may be measured by Farabeuf's combined gage and compressor (Fig. 6221 and v. Fig. 6222).

Some Operators now give a reasonable time for the spontaneous expulsion of the child – but if this is not soon accomplished, the majority of Obstetric Surgeons promptly apply forceps and deliver the child – if sufficient cervical dilatation be present.

During delivery, the pelvis should be particularly well supported – an Assistant holding each thigh – and, additionally, pressing inward upon the trochanters. Sometimes a binder is applied around the pelvis. The patient is sometimes placed in the Walcher position – the dependent position of the thighs being helpful generally

In the stretching of the parts during natural, or forceps delivery, the urethra may be injured _ and the bleeding from the prevesical venous plexus is increased _ and may require that gauze be packed behind the symphysis.

If the placenta do not promptly appear, it is expressed, or manually delivered.

Upon completion of delivery, the surgical traumatism should be completely repaired. Temporary drainage is wise _ as there is apt to be venous oozing from the rich plexuses. Drainage of the space of Retzius from above may be adopted _ even though against gravity. Zweifel suggested draining this space by gauze, or tube conducted from it, out through an incision in one of the labia minora. If any bleeding vessels are located, they are tied with fine catgut. The divided surfaces of the symphysis are brought together by chromic catgut sutures carried through the periosteum (Fig. 6222), applied while the opposite aspects of the pubic bones are held approximated by some form of coaptating forceps. This method of uniting the divided aspects usually suffices. Some Surgeons drill obliquely through the opposite ends of the pubic bones _ carrying chromic catgut, kangaroo-tendon, or even silver-wire through the drill holes, which are made with some such instrument as that shown in Fig. 6223.

Fig. 6223.—Farabeuf's Symphysiotomy Perforator and Ligature Carrier, Combined.

The final dressing and subsequent handling of the patient should be such as to safeguard the weakened joint, until solidification is established.

SYMPHYSIOTOMY, BY THE SUBCUTANEOUS METHOD _ FROM BEFORE, BACKWARD

AYERS

Description.—The division of the symphysis is here made by means of a bistoury, introduced through a small vertical incision, over the lower aspect of the front of the symphysis, cutting from before, backward _ guided by an intravaginal finger pressed against the posterior aspect of the symphysis.

The features of the various operations, of which this is one, are given at p. 789. The general methods of procedure, as to delivery and after-care, are the same as already covered in the open operation (v. p. 792).

Operation.—A sound, or catheter is passed through the urethra _ to serve both as a guide to its position during the manipulations, and to make possible, through its presence, the lateral displacement of the urethra, during the manipulations.

The clitoris is displaced upward, and a short median, vertical incision is made just above the subpubic ligament _ but below the clitoris. Through this limited incision, a sharp-pointed tenotome is first carried upward, beneath the overlying soft parts, and hugging the anterior surface of the symphysis _ up

to within about 1.3 cm. ($\frac{1}{2}$ inch) of the upper limit of the symphic joint. The tenotome is now withdrawn, and a curved probe-pointed bistoury carred through the course made by the tenotome – and is then pushed on up to the top of the front of the symphysis – where it comes into contact with the pulp of the Surgeon's left index-finger, which has been passed up the posterior aspect of the anterior vaginal wall – guided by the sound in the urethra, which it displaces well to one side, out of harm's way. This intravaginal finger serves as a guide – and the probe-point of the bistoury, being brought into contact with it, cuts its way downward through the interarticular cartilage – the probe-point and finger-point remaining pressed in close contact throughout the section – from the top of the joint, to its bottom – until the two halves of the pubis are felt to yield. The technic is shown in Fig. 6224.

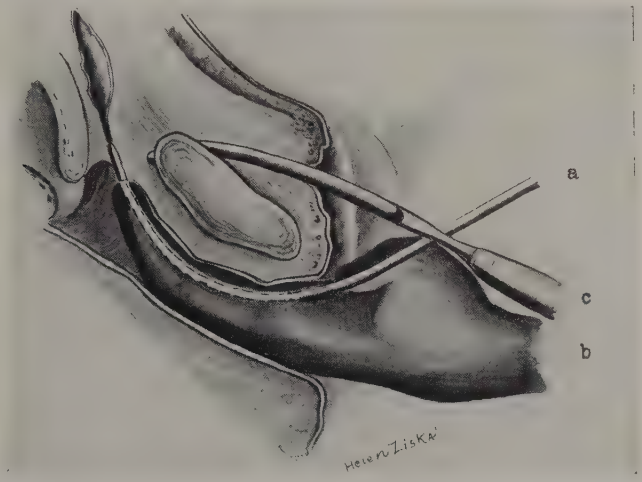


Fig. 6224.—Symphysiotomy, by the Subcutaneous Method – from Before, Backward – Ayers: – **a,** Sound within the urethra, by means of which it can be both located and pressed from the median line; – **b,** finger within the vagina, held against the center of the posterior aspect of the symphysis – displacing the sound-occupied urethra to one side, and guarding the tip of the probe-pointed knife in front, as it cuts through; – **c,** probe-pointed knife, preceded by tenotome, passing upward, from beneath the clitoris, to the top of the symphysis, hugging the symphysis – and then cutting medianly through the fibrocartilage, from above and in front, downward and backward, until the symphysis is felt to be severed.

A small pledget of gauze is temporary pressed into the tenotomy incision. The child is delivered with forceps. The bladder and urethra must be safeguarded as much as possible during all manipulations. It is well to place a catgut stitch or two in the pubic wound, owing to its proximity to soiling discharges. If much venous ooze comes from it, however, a small temporary drain should be inserted.

No method of repair of the separated parts of the symphysis by suture can, of course, be here practised – as the parts are inaccessible. The pelvic girdle should, therefore, be substantially reinforced by several superimposed strips of broad zinc-oxid plaster – and every care subsequently used in handling the patient, until solidification has taken place.

A catheter is retained in the bladder, until voluntary micturition is resumed.

SYMPHYSIOTOMY, BY THE SUPRAPUBIC ROUTE _ FROM BEHIND, FORWARD

MORISANI

Description.—The procedure here approximates that of a subcutaneous method, in that the suprapubic incision is only made for the passage of the

Fig. 6225.—Galbiati's Symphysiotomy Knife.

pecial knife _ after which, the symphyseal joint is divided in the median lines, from below, upward, and from behind, forward.

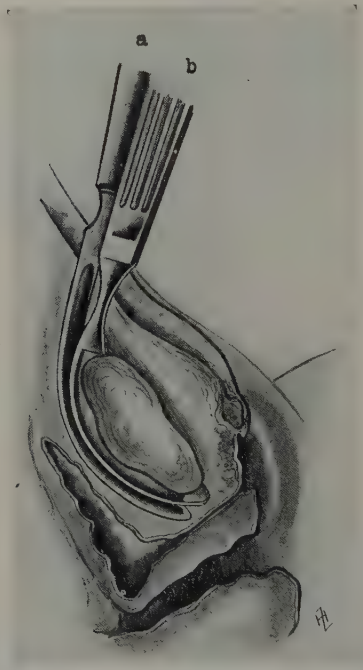


Fig. 6226.—Symphysiotomy, by the Suprapubic Route _ from Behind, Forward _ Morisani _ seen in sagittal section): _ a, Curved, grooved guide, passed through a limited median (or transverse) suprapubic incision _ passing down closely behind the symphysis; _ b, Galbiati's curved, probe-pointed knife, passed down upon the grooved director _ to sever the joint from behind and below, upward and outward _ the technic being conducted everywhere subcutaneously, except at the wound of entrance.

Operation.—The suprapubic incision of approach was formerly made transversely _ about 3 cm. ($1\frac{1}{8}$ inch) in length _ placed about 1 cm. ($\frac{7}{16}$ inch) above the symphysis pubis. This incision is now frequently made in a vertical direction. Its object is to expose the upper margin of the symphysis, and give

access to its posterior aspect. The inner borders of the pyramidales and reti muscles are separated and retracted laterally – and a way is prepared, by blunt dissection through the retropubic tissues, for the knife which is to make the symphysiotomy. The Galbiati curved, probe-pointed knife (Fig. 6225), or its equivalent, is then made to hug its way down behind the median line of the symphysis – either alone – or preceded by a curved grooved director (Fig. 6226). When the lower border of the symphysis is reached, the knife is drawn forward, and upward, dividing the symphyseal joint throughout – but avoiding cutting through the overlying soft parts in front – which is accomplished by counterpressing against the probe-end of the knife with the tip of the finger, to prevent its cutting all the way through.

The bladder, urethra, and clitoris should be especially guarded.

If the child is not expelled spontaneously, in reasonable time, it is delivered with forceps.

The wound is closed by suture.

Morisani immobilized the pelvis in a plaster-of-Paris dressing.

OPEN PUBIOTOMY

Description.—The entire width of the body of the pubic bone is exposed – and divided, under the eye and touch.

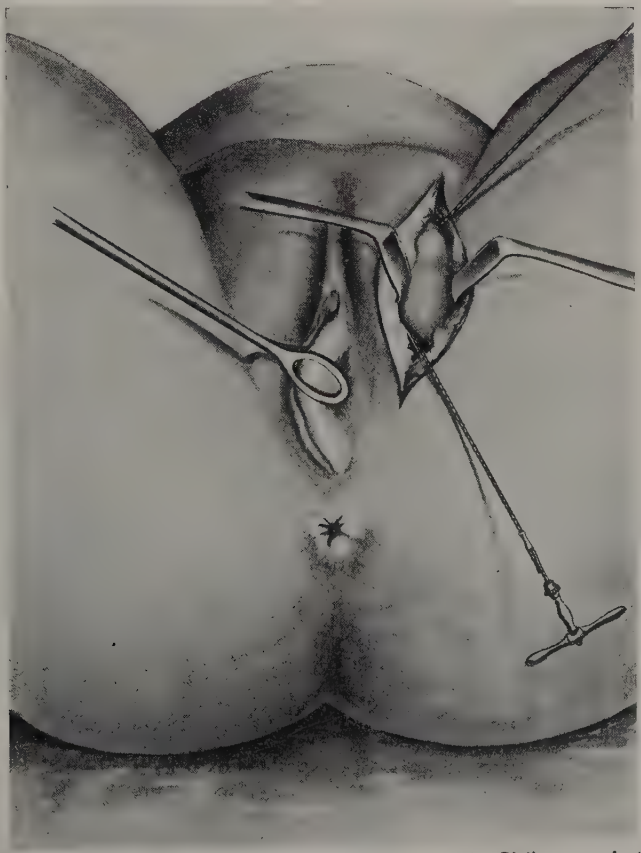


Fig. 6227.—Open Pubiotomy; – The soft parts have been incised – and a Gigli saw conducted behind the pubic ramus.

The features of the various operations, of which this is one, are given at p. 789.

Operation.—A slightly oblique incision is made through the overlying soft parts _ beginning just to the outer side of the spine of the os pubis, and passing, with downward and slightly inward obliquity, over the body of the pubic bone, to end at its lower border. The incision is planned to be placed over that side of the os pubis toward which the occiput presents _ which is generally the left side _ and which corresponds with the side upon which the right-handed Surgeon can most conveniently operate.

The overlying soft parts are laid open down to the face of the bone. The upper and lower borders of the body of the bone are exposed _ and the posterior aspect of the body carefully freed. When this has been accomplished, the oblique division of the bone is most conveniently made with a Gigli saw _ the technic being conducted as shown in Fig. 6227.

Especial care must be exercised in operating by the open method _ as the divided bone is no longer reinforced by unsevered overlying soft parts, as it is in the other methods of pubiotomy _ so that the parts must be manually supported with unusual care during the operation _ and, after careful suturing of the wound, be strongly supported by special dressings subsequently.

The features of delivery of the child, and the general postoperative care of the patient are the same, in general, as those employed in connection with pubiotomy by the other methods _ (either of which is more frequently performed than the open method) _ and as described in connection with the allied operation of symphysiotomy.

SUBCUTANEOUS PUBIOTOMY

BUMM

Description.—The body of the os pubis is obliquely divided by a Gigli saw, conducted by a special pubiotomy needle, or carrier _ the technic being accomplished entirely subcutaneously _ without the aid of a preceding knife-cut into the tissues.

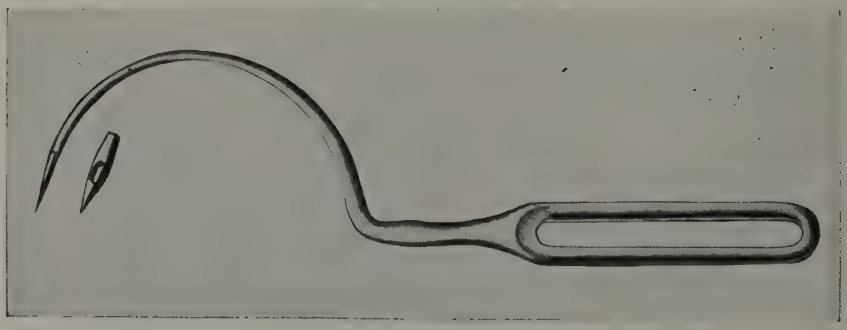


Fig. 6228.—Bumm's Pubeotomy Needle.

Operation.—The patient lies in the lithotomy position _ the vulva having been dry-shaved, and painted with a half-strength tincture of iodin. The Surgeon simultaneously displaces the left labium majus inward, and directs the point of the special pubiotomy needle (Fig. 6228), by introducing the fingers of his left hand into the vagina, with their pulps to its outer wall, and localizes the point of puncture directly below the border of the descending

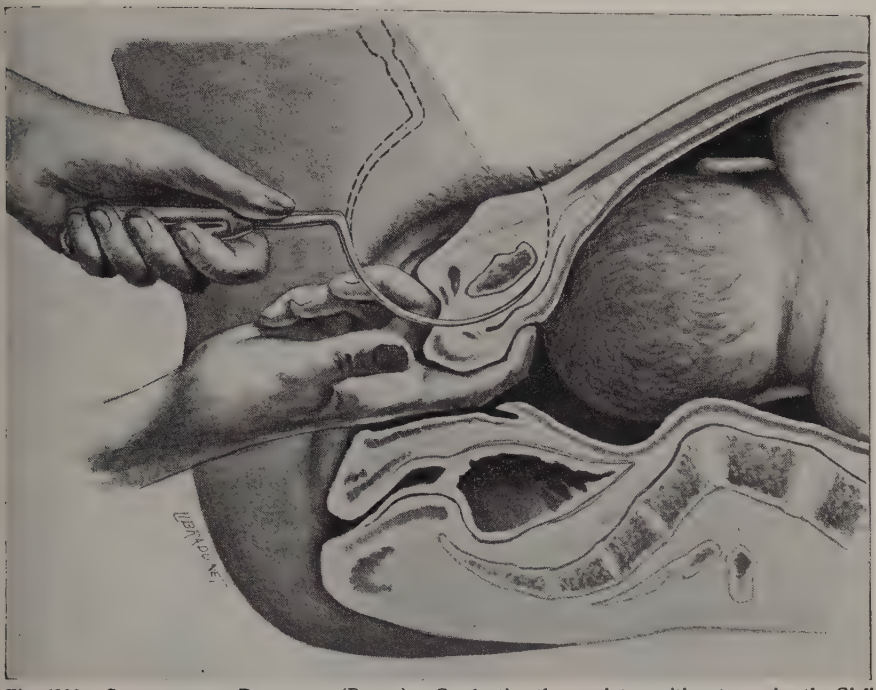


Fig. 6229.—Subcutaneous Pubiotomy (Bumm); – Conducting the saw into position, to receive the Gigli saw – I.

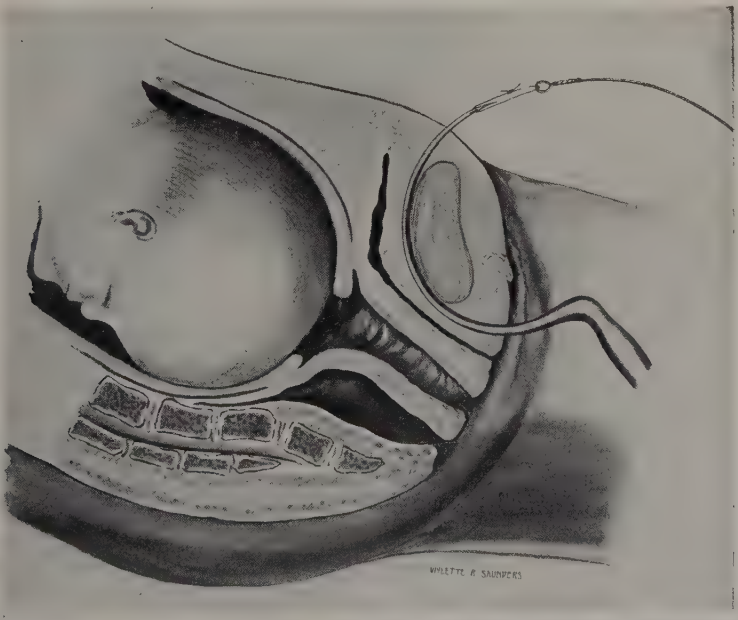


Fig. 6230.—The Same – II; – The carrier-needle is in the act of conducting a Gigli saw backward, behind the horizontal ramus of the pubis, in its withdrawal. The carrier is shown entering immediately below and passing closely behind the extra-articular aspect of the pubic bone, to emerge directly above it, just inside of the pubic spine – hugging the posterior wall of the pubic bone closely throughout.

ramus of the os pubis with his left thumb (Fig. 6229), entering the skin in the fold of reflection between the labium majus and labium of the left side, while drawing the labium minus and the clitoris mediad. As soon as the lower edge of the descending ramus of the os pubis is reached, the posterior surface of the bone is closely hugged _ and closely followed throughout the rest of the course of the pubiotomy needle up its posterior aspect (Fig. 6229), remembering that the importance of doing so is that the bladder lies directly behind _ and also that the more closely the bone is followed, less will be the damage done to the prevesical vascular plexus. Thus traveling behind the body of the os pubic, the point of the needle passes over the upper border of the body of the pubis bone and emerges from the skin at a point approximately 2 cm. ($\frac{3}{4}$ inch) to the outer side of the median line, directly inside of the spine of the os pubis. A Gigli wire saw is now fed to the pubiotomy needle (Fig. 6230) which is then drawn backward, in the reverse direction, carrying

Fig. 6231.—Sectioning the Symphysis Pubis, to One Side of the Median Line, by Means of a Gigli Saw _ the saw passing in the connective-tissue plane between the symphysis and the bladder.

the wire-saw with it. Handles are then adjusted to the loops of the saw _ which proceeds to cut its way through the bone, in a direction obliquely from above downward and inward (Van der Velde's section, v. Fig. 6218), by means of a steady, controlled back-and-forth movement (Fig. 6231). The progress of the saw through the bone is seen in Fig. 6232 _ where the section is being made with the patient in the Walcher position. The saw is so manipulated as to safeguard the soft parts as far as it is possible _ and Assistants are prepared to control the tendency of the limbs to eversion and the too great separation of the ends of the sawn bone (which should not be more than 2.5 cm. _ or 1 inch), as soon as the section is completed.

If the child is not spontaneously born as soon as the section is made, or within a very short period, according to the election of the Attendant, it is delivered by forceps, or by version.

There may be some bleeding from the wire-saw wounds. When this is controlled, the small wounds are sutured (unless temporary drainage be in-

dicated). Over the pelvic dressing, a substantial belt is snugly applied, and maintained.

Fig. 6232.—Subcutaneous Pubiotomy; – Lateral and semisectional view of the oblique division of the horizontal and descending ramus of the os pubis – carried out in Walcher's position.

The general features of the groups of symphysiotomy and pubiotomy operations, with their preparatory and after-treatment, are considered at p. 789.

PUBIOTOMY, BY COMBINED OPEN AND SUBCUTANEOUS TECHNIC

DÖDERLEIN

Description.—A limited opening is first made above the pubes – through which a finger is conducted behind and beneath the body of the os pubis, and out through the skin – after which the bone is divided by a Gigli wire saw. The salient features of this, probably the best method of performing pubiotomy, is that it enables the pathway for the wire-saw to be openly exposed and followed by the finger – and, subsequently, the soft parts support the pelvis.

Operation.—A short, transverse incision is made directly above the body of the os pubis, usually on the left – so placed as to expose a point 2 cm. ($\frac{3}{4}$ inch) laterad to the median line, and of sufficient extent to admit the finger. The incision passes through the skin and fascia overlying the left rectus muscle. Through this opening the right index-finger is passed – and, by blunt dissection, clears a pathway for the wire-saw, obliquely down the posterior

aspect of the body of the os pubis. Having thus prepared a passage for the wire-saw, Döderlein's special pubiotomy needle (saw-carrier) _ Fig. 6233 _ is

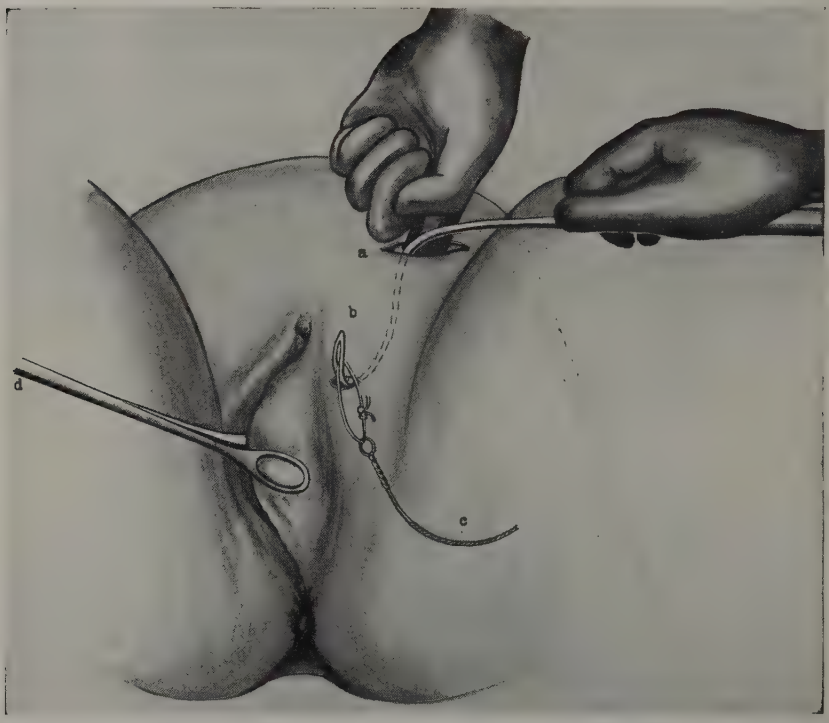


Fig. 6233.—Subcutaneous Pubiotomy _ Döderlein _ I: _ **a,** Transverse incision made over tubercle of horizontal ramus of pubis, through skin and fascia, down to rectal sheath, which is then divided vertically; _ **b,** pubiotomy needle, guided by finger in wound, conducted diagonally across the posterior aspect of the horizontal ramus, from the region of the tubercle, to the lower, inner border of the descending ramus of the pubis. On emergence, a Gigli saw, **c,** is threaded to the needle, and drawn through the wound in the reverse direction; _ **d,** tractor, drawing the labium to the opposite side.

Fig. 6234.—Döderlein's Pubiotomy Needle.

conducted through the path thus made, guided by the finger. The empty saw-carrier hugs the bone closely throughout _ until it sweeps forward immediately beneath its lower border _ and, where it impinges against the skin

a limited knife-incision is made, for its exit. An ordinary, laterally curved aneurysm needle of larger type will answer just as well for a carrier – as shown in Fig. 6234.

The section is made as in Bumm's method (v. p. 800) – except that as the saw has entered through a considerable opening, and emerged through an incision, it is possible to avoid cutting the skin with the wire-saw to the extent that it must be cut in the Bumm method – and also possible to better protect the deeper parts, both by conducting the saw a large part of the way by finger, and protecting the tissues by a curved spatula. The wounds are closed by suture at the end of the operation.

Following the operation, the patient's pelvic girdle is not as much weakened as it is in the open operation – though more weakened than after the strict subcutaneous method – so that reinforcement by encircling supports and dressings are indicated.

All of the features connected with the delivery of the child are as in the other forms of pubiotomy and symphysiotomy.

MANUAL AID IN THE DELIVERY OF THE CHILD, IN THE VARIOUS PRESENTATIONS – OTHER THAN BY VERSION (Separately Given on pp. 805–825)

The Stages of Labor have been summarized on p. 704 – the Mechanism of Labor, on p. 706 – and the Different Presentations, on p. 706 – all of which should be considered in this connection.

Manual aid by version, being common to more than one presentation, is given separately.

The various obstetric positions which the mother may assume during confinement – and the manner of supporting the perineum during labor – which are more or less common to all the presentations, have been described and pictured on pp. 707–711.

MANUAL AID IN THE DELIVERY OF THE CHILD IN VERTEX PRESENTATIONS

In this form of presentation occur the largest number of normal, physiologic labors – and the vertex presentation itself represents the physiologic standardization of labor – so that, naturally, there is here least seldom found the necessity for artificial aid in delivery. Here, as elsewhere, however, whenever undue retardation of progress is present, nature's efforts should be aided, and expedited, by the best available means, beginning with the simplest measures, before resorting to the more complex, or those more apt to traumatize.

Anterior occipital presentations are more favorable than those in which the occiput presents posteriorly. As a rule, vertex presentations should be left to nature as long as possible – but after a reasonable length of time, forceps should be applied. They are required about once in 7 cases of posterior occiput. In a high arrest of a posterior occiput, at the inlet, version is probably the best course.

Retardation of the head at the vaginal outlet is sometimes assisted by introducing two fingers into the rectum – far enough in occipito-anterior presentations, to get beneath the chin (carefully avoiding pressure over the eyes) – and then, during a pain, or even in its absence, help the chin over the perineum (Fig. 6235). Pressure over the fundus may be simultaneously made. This may enable a reasonable degree of cervical traction to be practised – until fingers can be slipped into the axillæ.

Extraction of the posterior shoulder, in delayed delivery of the shoulders, may often be accomplished by slipping the right index-finger, hook-fashion,

into the posterior axilla, while the head is supported in the opposite hand – and then practising traction with the axillary finger – pressing the neck up closely under the symphysis, to gain room, and drawing the thorax forward

Fig. 6235.—Aiding in the Expulsion of the Head, by the Introduction of Two Fingers Into the Rectum.

(Fig. 6236). As soon as the posterior shoulder is born, the posterior axilla is now pressed against the perineum – thereby giving the anterior shoulder room to be born. Sometimes the order of delivering the shoulders is reversed.

Fig. 6236.—Manual Extraction of the Posterior Shoulder, by a Finger in the Left Axilla – the opposite hand supporting the head.

Manual extraction of the shoulders, delayed after the birth of the head, may also be sometimes accomplished by a still different though allied maneuver – without inserting the finger into the axilla. The fingers are inter-

Fig. 6237.—Manual Extraction of the Shoulders, in Head Presentation – I; – The fingers and thumbs are interlocked beneath the chin, or grasp the angles of the jaw, and, while practising traction, press and draw the anterior shoulder beneath the symphysis – favoring the gliding of the opposite shoulder over the perineum.

Fig. 6238.—The Same – II; – Reversing the order, the axilla of the expelled arm is now pressed down against the perineum – thus giving room for the birth of the opposite shoulder.

locked about the neck, or press the angles of the jaws – and practice gentle traction forward and upward, bringing the anterior shoulder up under the symphysis (Fig. 6237) – so as to give room for the posterior shoulder to glide

Fig. 6239.—Changing the Left Occipito-posterior Into the Left Occipito-anterior Position – I; – The inner hand disengages and elevates the head, at the same time directing the occiput in its excursion around the pelvic inlet, toward the symphysis – while the outer hand presses the back of the child around in the same direction.

Fig. 6240.—Changing the Left Occipito-posterior, to Left Occipito-anterior Position – II; – The partly turned head is grasped by the fingers of the left hand and guided into the pelvis – while the fingers of the right hand aid in the descent by pressure applied against the occiput, through the abdominal wall, directed downward, from above the symphysis

over the perineum. Then when the posterior arm is born, the posterior axilla is pressed downward and backward against the perineum, thereby giving room for the anterior shoulder – during combined traction and backward pressure – to slip out from under the symphysis (Fig. 6238).

Conversion of occipito-posterior into occipito-anterior positions may sometimes be accomplished through manual manipulation, employed before the head is too firmly engaged. One method of accomplishing this, is to elevate and disengage the head from its original presentation, with occiput posterior, and to elevate it sufficiently for the forceps to be applied to have some effect. The fingers within the uterus then direct the occiput forward, around the shorter side of the pelvic circle, while the outside hand similarly presses the back of the child forward, around the same side (Fig. 6239). When the head is felt to

Fig. 6241.—Directing the Occiput Anteriorly, by Combined Manipulation; – the inner hand pressing the occiput toward the symphysis, with the fingers within the uterus and the thumb in the vagina – while the outer hand presses the forehead toward the sacrum.

have made this excursion until the occiput points forward, the fingers and thumb of the inner hand grasp the head, anteroposteriorly, and draw it into a state of engagement – the outer hand helping the maneuver by downward pressure against the occiput, applied behind the symphysis (Fig. 6240).

Conversion of an occipito-posterior into an occipito-anterior position is sometimes also accomplished by combined pressure of intra-uterine fingers against the posterior occiput, to bring it forward around the shorter side of the pelvis – while the fingers of the opposite hand presses, from without, the forward aspect of the head backward (Fig. 6241).

MANUAL AID IN THE DELIVERY OF THE CHILD, IN FACE PRESENTATIONS

In face presentations, the membranes should be especially preserved – both to protect the face, and, in posterior presentations of the chin, to be of

aid in its frequent forward rotation. The chin does not remain pointing posteriorly in more than about 1 per cent. of face presentations.

When the face is presenting posteriorly, but is not firmly engaged, an attempt may be made to substitute a vertex presentation for it — by either pushing the chin upward — or by drawing the occiput downward.

Some obstetric Surgeons advise leaving the case to nature, as long as all goes well — whether the chin present anteriorly, or posteriorly — preserving the membranes, and keeping up marked extension of the head by pressure upon the forehead.

Thorn's method of converting the face into an occipital presentation, consists in carrying a hand into the uterus, with which he tries to dislodge the

Fig. 6242.—Thorn's Technic of Converting Face to Occipital Presentation: — The inner hand tends to dislodge and flex upon the chest the extended head — while the outer hand first pushes the convex chest toward the child's spine, and then its buttocks in the direction of the now straightened chest. (Modified from DeLee.)

extended head and flex it upon the chest — during which the outer hand aids in straightening the child's axis, by pushing the convex chest in the direction of the child's back — after which the buttocks are drawn, from without, into line with the straightened chest (Fig. 6242). This maneuver has been very successful.

DeLee's method of changing the face to an occipital presentation, consists in introducing a hand into the uterus, with which he endeavors to overcome the extension of the head in very much the same manner that Thorn does (v. s.), by exercising direct pressure upon the convex chest — to first make it straight, and then concave (Fig. 6243), after which, he grasps the head and bring its downward, with the occiput forward — the outer hand, at the same

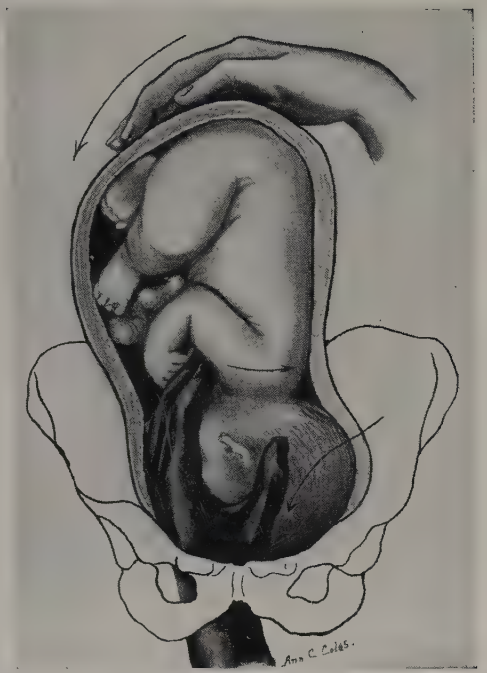


Fig. 6243.—DeLee's Technic of Changing Face to Occipital Presentation —I ; — Inner hand overcoming extended head by direct pressure upon convex chest (as Thorn does indirectly, from without — v. Fig. 6242), first making it straight and then concave, the thumb-grasp at the same time bringing the head downward. The outer hand displaces the breech to that side toward which the chin lay.

Fig. 6244.—The Same — II; — Inner hand, with fingers and thumb grasping face and occiput, and holding head flexed, draws the head into the pelvis, directing the occiput to the symphysis.

time, drawing the breech to the same side toward which the chin lay (Fig. 6244).

Schatz's method of external manipulation (q. v.) is sometimes advised.

The face may be so far and so firmly engaged that it cannot be disengaged by any of the above maneuvers. It may be allowed to continue to descend _ hoping that when the floor of the pelvis is reached, external rotation will occur. If this does not occur, after reasonable time, forceps should be applied, and effort made to rotate the chin forward _ failing in which, one of the major measures must be resorted to _ usually of dividing the pelvis _ or destruction of the child.

If the chin presents posteriorly, in spite of efforts at conversion _ and provided the os be sufficiently dilated, and the face can be dislodged, podalic version may be practised.

Following conversion, the case may become a high forceps one.

MANUAL AID IN THE DELIVERY OF THE CHILD, IN BROW PRESENTATIONS

In these presentations, the head is in a position midway between flexion (which is marked in vertex presentations) and extension (which is marked in face presentations) _ so that the brow (instead of either the occiput, as in vertex, or the chin, as in face presentation) presents. The presenting part is that portion of the head between the ridge of the orbit and the anterior fontanel.

The majority of cases which are brow presentation early in labor, fortunately spontaneously become either vertex or face presentations, as labor progresses. If posterior rotation of the brow persists, spontaneous delivery is impossible.

The ideal termination of posterior brow presentations, is spontaneous conversion into anterior presentations. If this fails, effort should be made to convert the brow presentation into an occipital one _ or, if the chin be anterior, into a face presentation.

Delayed action is only warrantable if the brow presentation at the upper strait seems to be temporary. If it be an anterior brow position at the upper strait, it will probably become a mento-anterior presentation and be delivered spontaneously. But if an anterior brow presentation seems likely to continue _ or if a posterior brow presentation be even transiently present, manual rectification should be attempted before the head has become molded and engaged _ conversion into an occipital, or a face presentation, or podalic version being better than waiting too long for a satisfactory spontaneous evolution.

Efforts will differ, dependent upon whether applied before or after the brow has become engaged.

Prior to the engagement of the brow, trial may be made by turning the patient to the side corresponding with the dorsal plane of the child _ or Schatz's external method (q. v.), or his combined external and internal method of manipulation may be tried.

Thorn's manipulation may be tried (v. p. 810).

Upward pressure of the brow by means of the entire hand _ and downward traction of the occiput by means of the entire hand _ may be tried.

Version (v. p. 749) is often the best course _ if it can be carried out.

Forceps are apt to do a considerable amount of damage to the soft parts, if applied before some degree of rectification has taken place _ owing to the large circumference of the presenting part.

Where the brow presents anteriorly, one may endeavor to convert this

into a face presentation, by intravaginal manipulations _ or the hand may be introduced into the uterus and podalic version practised.

After the engagement of the brow, effort may still be made to rectify the presentation by the methods already described _ but, naturally, are less apt to succeed correspondingly with the degree of engagement of the brow.

Division of the pelvis _ or destruction of the child _ may be required.

MANUAL AID IN THE DELIVERY OF THE CHILD, IN PELVIC (BREECH) PRESENTATIONS

The prognosis for the mother, in those cases which terminate spontaneously, is about as good as it is in vertex cases, though she is due to be more extensively torn _ while it is bad for the child.

Fig. 6245.—Manual Delivery of Anterior Leg and Thigh, in Breech Presentation; _ If the leg be flexed upon the thigh, the foot is simply seized and brought down. If the leg be extended against the chest, the maneuver described in Fig. 6246 is employed.

The aid to be given in breech cases will largely depend upon the stage at which the aid is called for _ whether before labor begins _ during labor, but before the birth of any part of the child _ or after the partial birth of the child. The unruptured membranes should be especially preserved as long as possible, as the best preparatory dilator. All means should be at hand for the immediate revival of the child.

Prior to the beginning of labor – in the latter weeks of pregnancy – effort should be made to convert the breech presentation into a vertex presentation, by external version (v. p. 751) – which, in a comparatively relaxed abdominal wall, especially in multiparæ, is usually accomplishable. The tendency of recurrence of the malposition is then prevented by the wearing of some special form of abdominal support.

After labor has begun – and provided the breech has not become engaged in the pelvis – the substitution of the vertex for the breech, by external version, or combined external and internal version (v. p. 752), may still be tried.

If the case be not seen until too late to attempt replacement of the vertex for the head (that is, after engagement) – or if it be not desired to do so, even if seen in time – then no interference is usually offered until there arises indications for its need – which are met in the various ways to be described.

Fig. 6246.—Bringing Down the Extended Lower Limbs, in Breech Presentations; – The knee is flexed by bending the leg upon the thigh, over the last two phalanges of the introduced hand, as an axis.

It is after the umbilicus is born, that there is need for the greatest expedition in the termination of labor – for it is considered that not more than from three to seven minutes are available, after this, in which a living child may be born.

In the general manipulations of evacuating the uterus pressure should be kept applied to the fundus, so as to press the uterine walls about the child, and thereby prevent extension of the head and of the arms above the head.

Extraction of the breech arrested at the pelvic inlet by traction upon a delivered leg is a method frequently employed. The Operator carries that hand into the uterus the palm of which best adapts itself to the fetal abdomen. The anterior foot is seized. If it be flexed, it is at once grasped and brought down (Fig. 6245). If it be extended, it is first grasped below the knee – and flexed upon the thigh and brought downward (Fig. 6246). When the fold of the

groin is low enough, further aid may be secured by hooking a finger into this groin _ by means of which additional traction may be made. Traction is

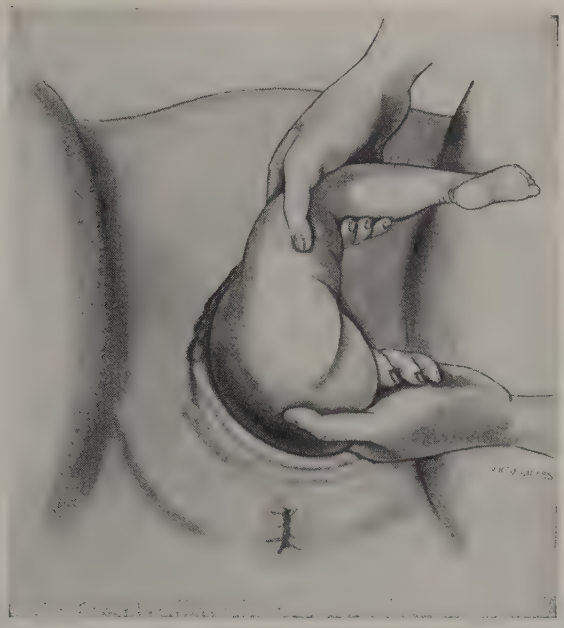
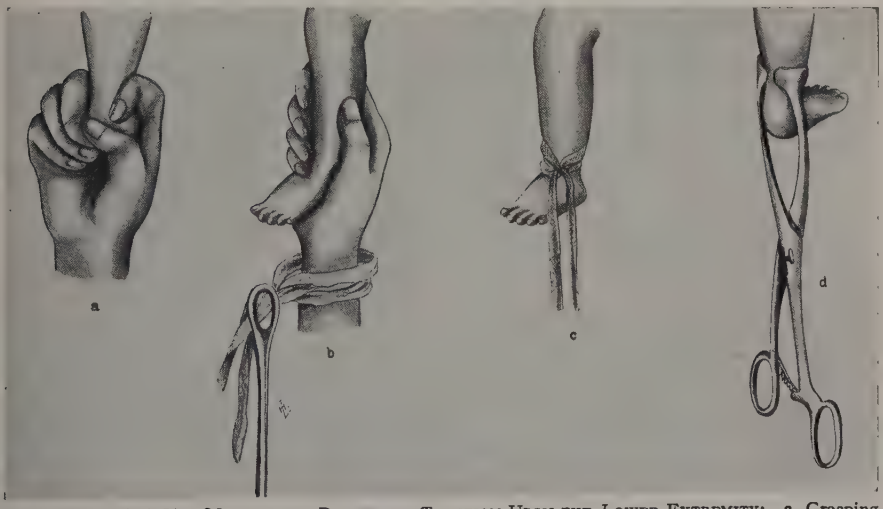


Fig. 6247.—Manual Delivery of the Posterior Leg and Thigh, in Breech Presentations



Figs. 6248–6251.—Methods of Practising Traction Upon the Lower Extremity: _ a, Grasping the ankle between the first and second fingers, steadied by the thumb; _ b, holding the foot and lower leg in the closed hand _ while a loosely knotted fillet is being carried up over the hand and foot, by a sponge-holder, to grasp the ankle upon the withdrawal of the hand; _ c, fillet, tightened; _ d, Collin's foot-extractor (made straight and curved).

exercised in the axis of the inlet, and during pains. This traction, in conjunction with downward pressure upon the fundus, cause the posterior groin to

come down within reach – when a finger (of the hand corresponding with the child's back) hooked within it will additionally aid in the downward traction (Fig. 6247). It is considered that the soft parts are better dilated by bringing down one foot, rather than two.

If instead of delivering the anterior leg the posterior one should be found delivered, one should watch, inactively, during the next pain, so that when traction is again applied, the proper direction of the rotation can be aided, rather than counteracted.

Guard against prolapse of the cord while bringing the foot down – and also against the child's straddling the cord. A loop of the straddled cord must be slipped over the anterior foot – or, if it cannot, the cord must be doubly clamped and divided – followed by rapid delivery.

Various means of securing the foot, for the purpose of practising traction, are shown in Figs. 6248–6251.

Fig. 6252.—Traction Upon the Breech – by means of both index-fingers in the groins.

Extraction of the breech at the outlet, by digital traction applied to the groins – As soon as the anterior groin can be reached, a finger hooked within it, will aid in its extraction (Fig. 6252). Under this traction, the breech is brought down until the opposite finger can be introduced into the posterior groin – when double traction may be employed – as illustrated – and one thigh be delivered before the other – or both simultaneously.

Extraction of the breech at the outlet, by traction with hook or fillet – is sometimes employed, but is generally inferior to digital traction. The blunt hook (Fig. 6253, **a**) is inserted into the groin – but sometimes damages both mother and child. A fillet, in the form of a strip of bandage, is sometimes conducted, by means of a stilet and soft catheter, around the flexure of one, or of both thighs (v. Fig. 6253, **b**) – and used as a tractor. It is chiefly employed when the folds of the groin cannot be reached by the fingers. Traction is only made during pains – and in the indicated axis of the parturient canal.

Extraction by the feet, of breech presentations impacted in the cavity of the pelvis: – Effort should be made to disengage and deliver the parts – failing in which, section of the pelvic brim, cesarean section, or destruction of the child must be considered. If one foot presents, this is grasped between the

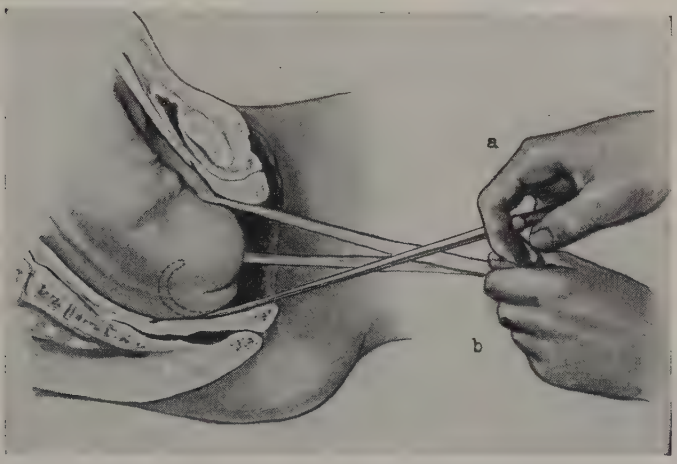


Fig. 6253.—Traction Upon the Breech: – a, By means of a blunt hook; – b, by means of a fillet. (Modified from Edgar.)

index- and ring fingers, the thumb steadying the part by pressure against the sole. If both feet present, the second finger passes between them, and the adjacent fingers to the outer sides of each leg. Traction is practised, in the axis

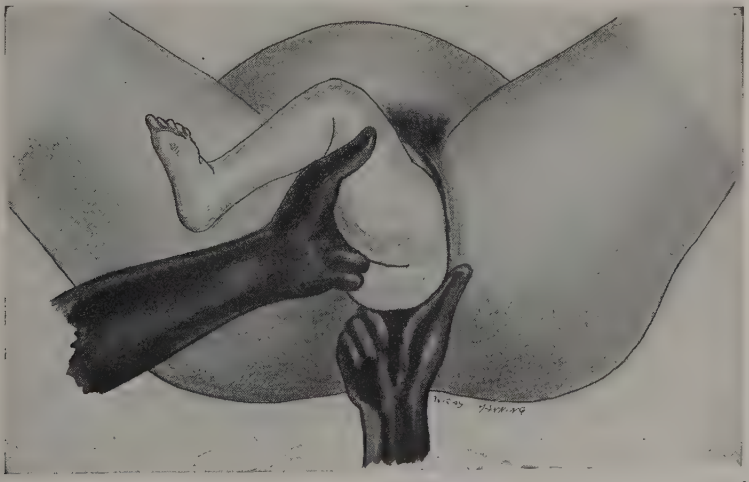


Fig. 6254.—Delivery of the Breech, by Traction of the Fingers in the Groin; – The anterior limb has just been delivered – and the right forefinger is practising traction upon the posterior groin.

of the outlet, until traction can be shifted to the groins (Fig. 6254) – and when the thighs are delivered in the anteroposterior axis, the buttocks are seized (Fig. 6255) – and the rotation of the child followed, while downward pressure upon the fundus endeavors to prevent extension of head and arms.

Forceps are sometimes applied to the breech – both at the inlet and in the cavity of the pelvis – but usually only if other measures fail.

Delivery of the extended arms: – If the arms are flexed upon the chest, it is usually a simple matter to first sweep the child's right hand down over its abdomen and out through the vulva, by means of the Operator's left hand, while supporting the legs with his right – and then to deliver the child's left with his right, in the same manner. If the arms are extended above the head, the maneuver is somewhat more difficult. The posterior arm is delivered by slightly elevating the child's body by the feet, which are held in one hand, at the same time that the child's body is drawn toward its mother's left, and its back turned slightly to her right (this inclination to the right not being shown

Fig. 6255.—Traction Upon Both Buttocks, in Breech Delivery.

in the illustration) – thus giving room for manipulation on that side. The Operator then carries that hand, the palm of which will hug the child, or two or three fingers of this hand, up along the extended arm, until the scapula of the child is reached – and then passes along the back of the arm, to the elbow (Fig. 6256). A finger hooked into the elbow-joint and drawn downward will flex the arm – after which, the forearm is extended and brought through the vulva – "wiping" the limb across the child's face, chest, and abdomen, as it were. This process is now reversed – the opposite hand grasping the feet, and elevating and directing the child's delivered body over the mother's opposite thigh. The technic of delivering the arms with the child's back forward, is seen in Fig. 6257. It is to be remembered that only from three to seven minutes are available for delivering a living child, after the umbilicus is born –

Fig. 6256.—Delivery of the Arms Above the Head, in Sacroposterior Presentations; – While supporting the child, the left hand follows the left side of the back to the shoulder, and sweeps the left arm across the chest, and out through the cervix – when the hands are reversed, and the same technic is carried out on the opposite side, with the opposite hand.

Fig. 6257.—Delivery of the Extended Arms, in Breech Presentation – aided by rotation of the child to bring an arm (which was in an anterior position here) into the posterior, roomier pelvis.

and that, while prompt action is necessary, the child's humerus has been broken in these maneuvers.

Delivery in dorsal displacement of the arms and forearms (nuchal hitch): _ The flexion and wedging of the forearms upon the extended arms, behind the neck is usually the result of some error of manipulative technic. The condition represents an exaggerated degree of simple extension of the arms (Fig. 6258) _ and impedes birth, even more than the last condition, until they are brought down. Effort may be made to dislodge and bring down the arms by the introduction of the entire hand into the uterus, with the palm to the child's back _ causing the forearms to first sweep over the head, and then downward

Fig. 6258.—Manual Delivery of an Arm Extended Above the Head, in Non-cephalic Presentations; _ The right hand, palm to back, sweeps the right arm of the child downward, across the front of the chest, until the hand presents. The left hand then repeats the maneuver on the left side.

over the chest. Another method which may be employed, is to cause the body of the child to rotate in a direction opposite to that which brought about the displacement _ so as to bring the limbs in front of the head _ but this should not be brought about by twisting the body, and, through it, the spine.

Delivery of the after-coming head by traction upon the jaw and shoulders, combined with suprapubic pressure _ as illustrated in Fig. 6259 _ may be sometimes successfully employed.

Delivery of the after-coming head, with the back anterior, by combined jaw-traction and suprapubic pressure: _ The body of the child is held straddling the front of the forearm of the Accoucheur _ the pronator surface corre-

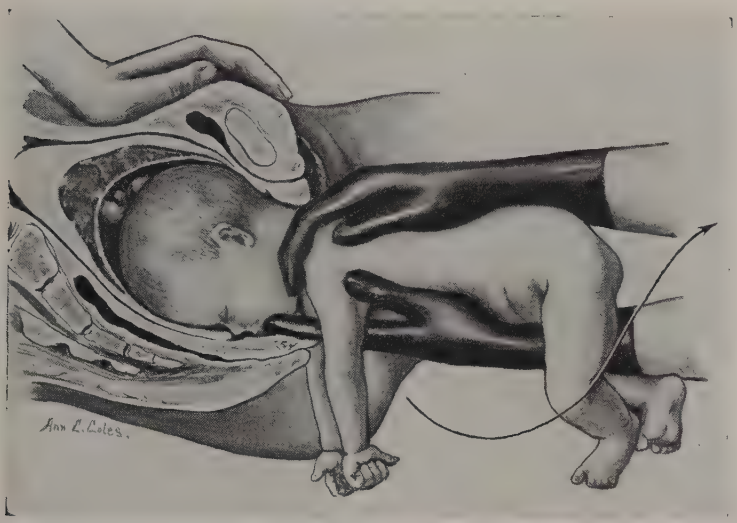


Fig. 6259.—Delivery of the After-coming Head, in Occipito-anterior Presentations – by the fingers of one hand in the mouth, and the fingers of the other hand embracing the neck and shoulders – aided by the Assistant's hand upon the abdomen, exercising pressure from without.

Fig. 6260.—Wiegand-Martin Manual Delivery of the After-coming Head, in Occipito-posterior Presentations; – The accoucheur's hand, the palm of which corresponds with the child's belly, is insinuated into the vagina, until one or two fingers can be inserted into its mouth, as tractors – while the opposite hand, without, applies downward pressure.

sponding with the abdominal wall of the child. The first and second fingers are carried into the vagina and into the child's mouth, where they serve as a hook, while the thumb is pressed against the jaw. As traction is practised

Fig. 6261.—Delivery of the After-coming Head, in Sacro-posterior Positions _ by combined jaw and shoulder traction, with extension.

Fig. 6262.—Manual Flexion and Extraction of an Extended. After-coming Head, at the Pelvic Brim.

the head is first flexed upon the neck _ and then, by continued traction with this hand and downward pressure applied by the other hand through the ab-

dominal wall, above the symphysis, in the direction of the pelvic curve. Between pressure above and traction below, the occiput is carried through the oblique diameter of the pelvis, and, rotating anteriorly, passes under the symphysis (Fig. 6260), the body being finally directed upward, while the chin, mouth, nose, and forehead sweep over the perineum.

Delivery of the after-coming head, with the back posterior, and the head flexed, by shoulder and mouth traction: – The mouth is usually within reach of two fingers of the right hand, by means of which the head is held flexed, and part of the downward traction is made (Fig. 6261). The back of the child lies upon the front of the Operator's forearm, while his first and second fingers surro und the back and sides of the neck, and are employed as tractors. The traction force is exercised in a downward and backward direction as indicated by the arrows – the object being to first distend the perineum – and then deliver the head.

Fig. 6263.—Delivery of the After-coming Head, in Face-to-abdomen Presentations – by combined dislodgment of the chin from behind the pubis by external pressure, shoulder traction, and sweeping of child's abdomen around mother's pubis. The solid figure represents the earlier, and the dotted figure the later, steps.

A similar type of delivery of an extended head of the pelvic brim is shown in Fig. 6262.

Delivery of the after-coming head with the back posterior and the head extended, by combined shoulder traction and outward pressure: – The chin is not within reach – and the mouth less so. The Operator seizes the child's feet with one hand – or the child lies, in the earlier stage, with its back upon the front of his forearm – while his fingers are passed around its neck and over its shoulders, as tractors (Fig. 6263). The pressure of a hand over the symphysis serves as a depressor of the head. The object of the technic is to cause the neck and chin of the child to pivot around the pubic arch. Depression and traction are first applied in a downward and backward direction – and then the body of the child is swept forward – the neck turning around the symphysis,

until the abdominal wall of the child is nearly parallel with or touches the mother's abdominal wall – bringing the occiput over the perineum, as the head is born. The hand grasping the shoulders is used as a fulcrum, over which the hand holding the feet, when these are separately seized, and carried over the mother, levers the head out, as it were. So much force may be used that the method is condemned by some, as exposing the neck to the danger of breakage.

Manual rotation of the transversely lying head by combined internal and external rotation: – In some cases where there is no impaction, it may be possible to direct forward the occiput of a transversely placed head by pressing backward against the jaw with two fingers carried into the uterus – while an

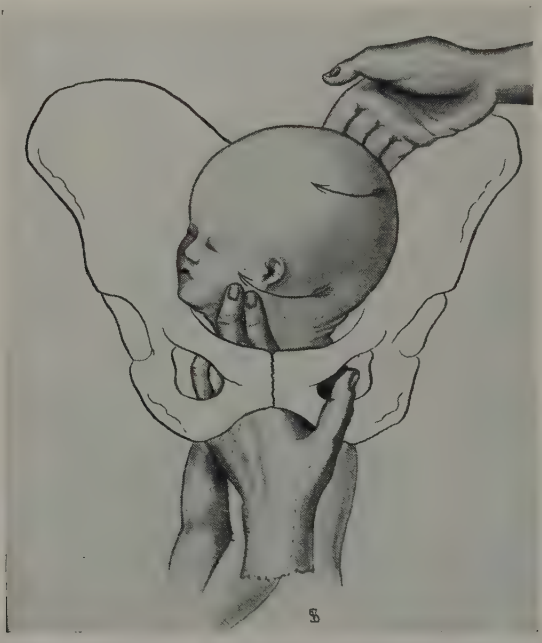


Fig. 6264.—Combined Bimanual Rotation of the After-coming Head, in Occipito-posterior Positions; – The inner hand directs the chin backward, by pressure upon the side of the face, applied within the uterus – while the outer hand directs the occiput forward, by pressure through the abdomina wall from without.

outside hand presses forward the opposite side of the posterior polc of the head, toward the symphysis (Fig. 6264).

MANUAL AID IN THE DELIVERY OF THE CHILD, IN SHOULDER (TRANSVERSE) PRESENTATIONS

Version – in some form, at some period – forms the basis of action in these cases – for in this type af presentation, pre-eminently, is the case unable to take care of itself. Spontaneous evolution is too rare to consider – and neglect of interference is apt to end in the death of both mother and child.

If the case be seen toward the termination of pregnancy, and before labor has begun, cephalic version by external manipulation (v. p. 751) should be performed – and then effort be made to retain the child in its new position by special form of abdominal support, until labor begins. If, though there be

such pelvic deformity as to make it unlikely that the child, even though turned, could be born, cesarean section would probably be the indication.

If the patient be seen after labor has begun, but before the membranes have ruptured, external cephalic version should still be tried — though not promising in result.

If the patient be in labor when seen — with a partially dilated cervix — bipolar version should be tried (v. p. 752). Or complete dilation should be brought about, and then internal podalic version practised, followed by immediate extraction.

If, when seen, the os is fully dilated, internal podalic version, followed by immediate extraction, should be the course — if these be possible. Otherwise, destruction of the child — or cesarean section must be considered.

FORCEPS DELIVERY

Description.—Delivery accomplished through the mechanical aid of forceps — bibladed and interlockable instruments made for exercising traction upon the head of the presenting child.

Forms of Forceps.—The general principle of structure and action of all forceps are the same — but a considerable variety of forms, sizes, lengths, and curves exists, as well as differences in some modifying adjustments.

The vectis (Fig. 6265), a single-bladed instrument, antedated the bibladed forceps — and was used as a combined lever and tractor. It is now rarely em-

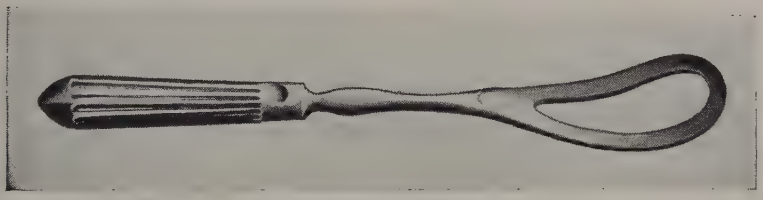


Fig. 6265.—Plain Vectis.

ployed — and if its function is desired, one blade of a pair of forceps is generally used.

Short obstetric forceps — such as shown in Fig. 6266 — are for use in the lower portion of the parturient canal.

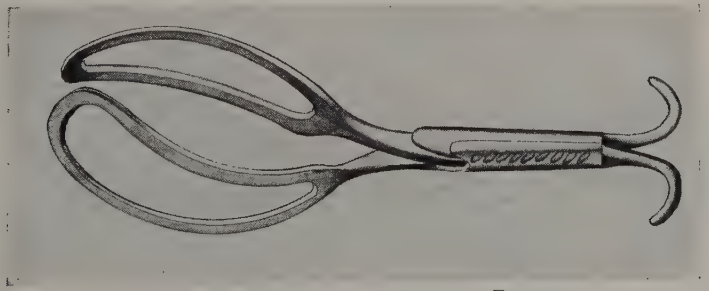


Fig. 6266.—Sawyer's Short Obstetric Forceps.

Long obstetric forceps are seen in Figs. 6267 and 6268 — and are used in the intermediate and higher parts of the parturient tract.

Solid-bladed forceps are exceptionally employed (Fig. 6269). Their salient feature is, that they prevent such damage as sometimes occurs when

the fenestrated blade of the ordinary forceps gets an ear, or the nose within its window. This danger is very real _ and its results, in deformity, are apt to be lifelong. Bad laceration and absolute destruction of these organs have

Fig. 6267.—Bradford's Long Obstetric Forceps.

resulted from the windowed blades of ordinary forceps _ the continued use of which is one of the remarkable things in the profession _ as, manifestly, the window of the forceps blade has no rôle to play, except one of potential damage (and the lightening of the instrument).

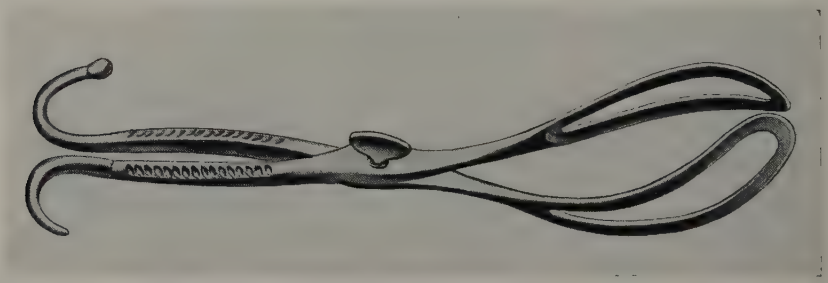


Fig. 6268.—Dubois' Long (High) Obstetric Forceps.

Axis-traction forceps (Fig. 6270) have been an exceedingly useful outgrowth of ordinary forceps _ enabling, as they do, traction to be made in the axis of the pelvis, in high forceps delivery. When traction is exercised with

Fig. 6269.—Olshausen's Solid-bladed Obstetric Forceps.

long forceps, under ordinary circumstances, much of the force is expended against the anterior bony wall of the pelvic girdle.

The blades of all forceps have two curves _ one, called the cephalic curve (Fig. 6271, a), which applies itself to the lateral convex curvatures of the child's

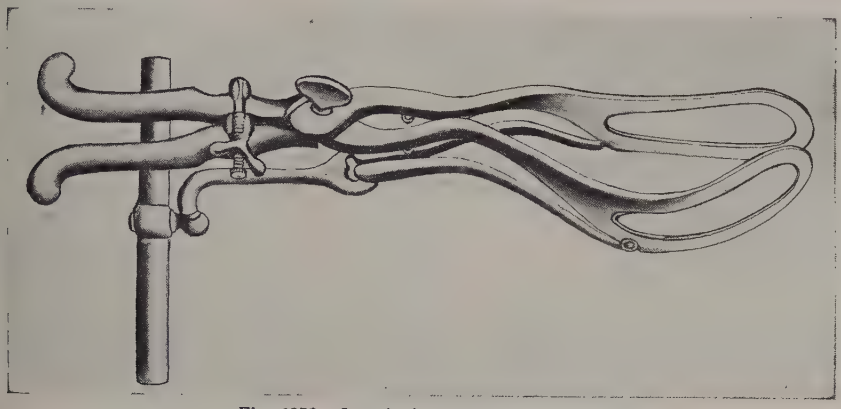
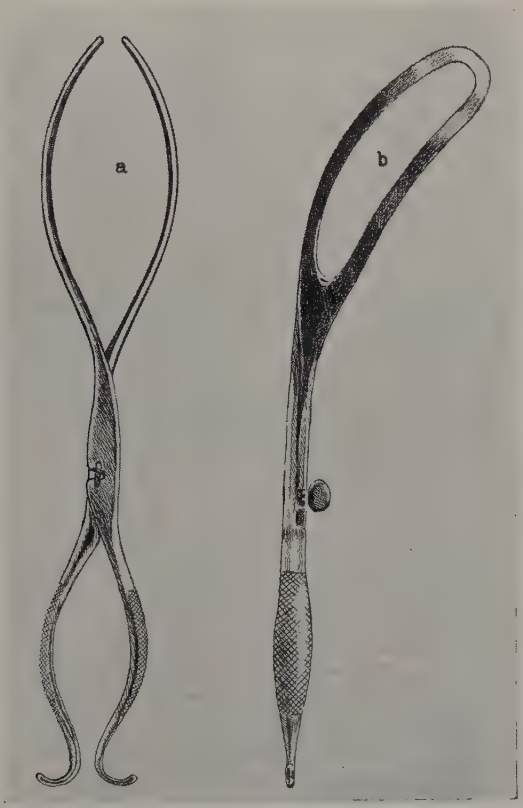


Fig. 6270.—Lusk's Axis-traction Forceps.



Figs. 6271 and 6272.—Essential Curves of Forceps: _ a, Cephalic curve, grasping convexities of child's head; _ b, pelvic curve, corresponding with the curved axis of the bony pelvis.

head _ and the other, the pelvic curve (Fig. 6272, b), which is received into the concave curvatures of the vagino-utero-pelvic structures.

Functions of Forceps.—(*a*) The primary use of the forceps is as a tractor _ a means of artificially taking hold of, and pulling upon the presenting part. Potentially this may be great _ the degree of its exercise must be determined by the Operator _ and especially in conjunction with the element of compression. (*b*) As a lever. This usage of the forceps has been much discussed _ and its systematic use, unless the head be very movable, should be much condemned. A certain degree of leverage must occur whenever the forceps are "rocked" _ which is a part of the technic of using them. (*c*) A very harmful degree of leverage may be exercised in using the forceps as rotators _ as in occipito-posterior and mento-posterior presentations. (*d*) As an exciter of uterine action. The mere presence of the forceps _ even sometimes the introduction of a single blade _ will stimulate the uterus to contraction _ but this action is uncertain. It is not just to enumerate only the good and omit

Fig. 6273.—Slipping of Forceps, in Adjustment, or in Traction: _ a, Axial slipping; _ b, ex-axial slipping.

the bad functions of an instrument _ and the next two are of the latter category. (*e*) As a compressor. This is an unfortunate and an unavoidable accompaniment of traction. The forceps cannot exercise traction until it first *compresses* sufficiently to get a hold which will *not slip* (Fig. 6273) _ and it is the securing of this hold, and especially the maintaining of it, which may do considerable damage. It must be perfectly plain that the heavier type of forceps _ particularly those of the axis-traction type _ may very readily overstep mere forceps' limit _ and unknowingly become actual cephalotribes. There is no question whatever that many children have been accidentally killed by head-compression with forceps _ just as they have been purposely killed by head-compression with cephalotribes employed without preceding craniopuncture. Many powerful axis-traction forceps are capable of accomplishing cephalotripsy _ and probably have often done so. It would be desirable to secure the maximum traction power, with the minimum compression force

– but, unfortunately, this is not regulatable. Barnes estimated that the pressure of the forceps is equal to one-half their traction – so that if one exercises 50 pounds of traction, they will bring 25 pounds of pressure upon the head. How much pressure the head will safely stand, in its different diameters, has never been determined. It would seem that a mechanical device, adaptable, when required, to the handles of forceps, could be made to register the amount of both traction and compression which is being exercised – just as they are made to register the traction power of a man's arm, and the compression power of his hand. (*f*) As a possible traumatizer. The damage sometimes done the nose and ears has been mentioned. The skull is often bent-in and ridged-in, locally – some such depressions remaining throughout life. Minor lacerations of soft parts, other than those cited, are usually of much less moment.

Indications for the Use of Forceps.—The primary indication for the use of forceps, is – to aid in the birth of the head, rarely of the breech – in cases where, on account of either mother or child, it is desirable to hasten delivery – and, in some cases, to actually make delivery possible, irrespective of expediting it. These necessities may arise because of conditions of the child – mechanical obstructions in, or adjacent to, the parturient canal – because of lack of expulsive force or to disproportion between fetus and passage.

Emphasizing the above generalizations, some of the specific indications are such as the following: – (*a*) Maternal Indications: – uterine inertia – rigid pelvic sling and perineal floor – some unusual position of the uterus – exhaustion – eclampsia – disease of heart, lungs, kidney, or other constitutional condition – antepartum hemorrhage – and the like. (*b*) Fetal Indications: – decreasing heart action, indicative of cardiac or respiratory condition – prolapsus funis – unfavorable presentation – arrested progress in favorable position – locked twins – prolapse of upper extremity – and the like.

Forceps may be used in all vertex presentations, especially in unreduced occipito-posterior positions – in face presentations – to the after-coming head in breech presentations – but are not usually employed in brow presentations.

Delivery by Forceps, Versus Delivery by Version.—The determination as to which is indicated in the particular case, may be somewhat difficult. The matter must be largely decided by the individual Operator, in the individual case.

If it be elected to perform version, and this be begun, it must be completed – while the delivery of a case may be begun by forceps, and completed by version.

When an unfavorable presentation of the posterior occiput, or of the face, or brow occurs at the pelvic brim – or even when a favorable presentation is taking place at the brim, but is not engaged – version is preferable to forceps.

All in all – and other things being equal – the child's chances are better with forceps.

Forceps are usually safer, especially for the child, in delivering primiparæ – and also for premature children.

Marked narrowing of the transverse diameter at the pelvic brim is a contraindication to version.

Necessary Preliminaries to the Use of Forceps.—The full dilatation of the cervical canal – head presentation (or, exceptionally, the breech) – pelvis free of marked contraction – no considerable disproportion between the head and pelvis – membranes ruptured – engagement of the presenting part, and the accurate diagnosis of the presentation.

Varieties of Forceps Operations.—(*a*) High Forceps – when the maximum diameter of the head is above the pelvic brim (Fig. 6274); – (*b*) Median

Forceps _ when the maximum diameter of the head has descended below the pelvic brim, but the head is still in the transverse or oblique diameter; _ (*c*) Low Forceps _ when the head is upon, or near the pelvic floor, and the occiput has rotated under, or nearly under, the symphysis. Forceps are not warrantable until the head has become engaged in at least the pelvic brim.

Preparations for the Use of Forceps.—These cover several headings.

Examination to Corroborate Presentation:_This is fundamental_for without an accurate foreknowledge of the nature of the presentation, the application of forceps partakes of the nature of a "grab-bag" procedure

Bladder and Bowels: _ These should be emptied _ the bladder by catheter, if necessary, and the rectum, by irrigation.

Fig. 6274.—Illustration, in a General Way, of Heads at the Inlet, in the Cavity, and at the Outlet of the Parturient Canal _ in the Transverse, Oblique, and Anteroposterior Diameters _ in Positions for the High, Median, and Low Forceps Application.

Vulva and Vagina: _ The vulva should be scrubbed and disinfected _ and the vagina irrigated with some antiseptic solution, of appropriate strength _ especially if manipulations have been made _ followed by irrigation with normal saline solution. The vulval opening should be protected by sterile draperies.

Accoucheur's Hands and Instruments: _ Prepared as for any operation in which they may carry infection _ and rubber-gloved.

Position of the Patient: The patient should be upon a table _ at its end _ in the dorsal gynecologic posture, with her thighs supported. If a bed must be used, should lie in the so-called "cross-bed" position _ though probably the majority of labors take place with the patient lying in bed, in the usual sleeping posture, parallel with its edge. The especial indication for the table posture is, that if emergencies arise, they can be much better and more technically met, than if the patient were in bed. In America, and on the Conti-

Fig. 6275.—The Application of Forceps, in the Dorsal Position.

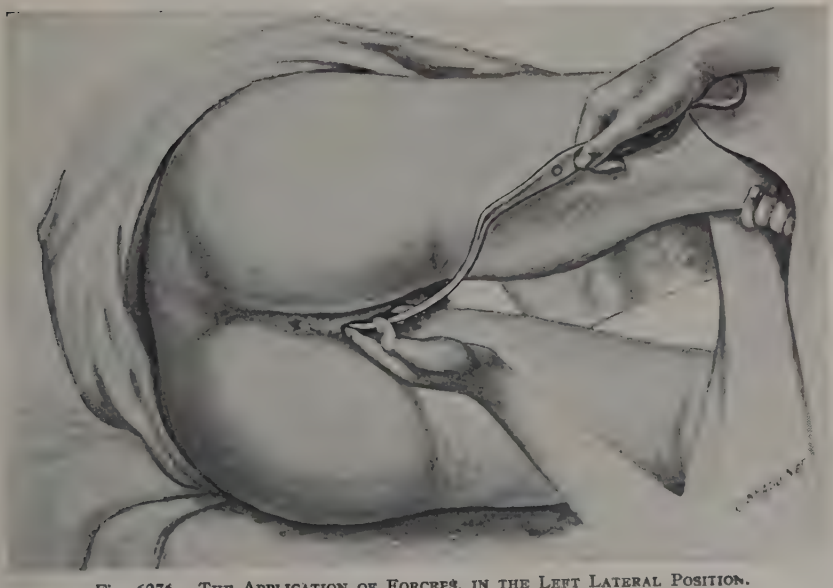


Fig. 6276.—The Application of Forceps, in the Left Lateral Position.

nent, the dorsal position is almost exclusively used. This is shown in Fig. 6275. In Great Britain, the patient generally lies in the left lateral position – her body lying across the bed, with her buttocks at its edge, and her thighs flexed on the abdomen. The right thigh is held up, in introducing the forceps and in delivery (Fig. 6276). The position is not so satisfactory, for many reasons, as is the lithotomy posture – nor is it easy to keep the patient from infection in its use. Walcher's position (Fig. 6277) is sometimes assumed – in cases of contracted pelvis, where it is desired to lengthen the true conjugate diameter

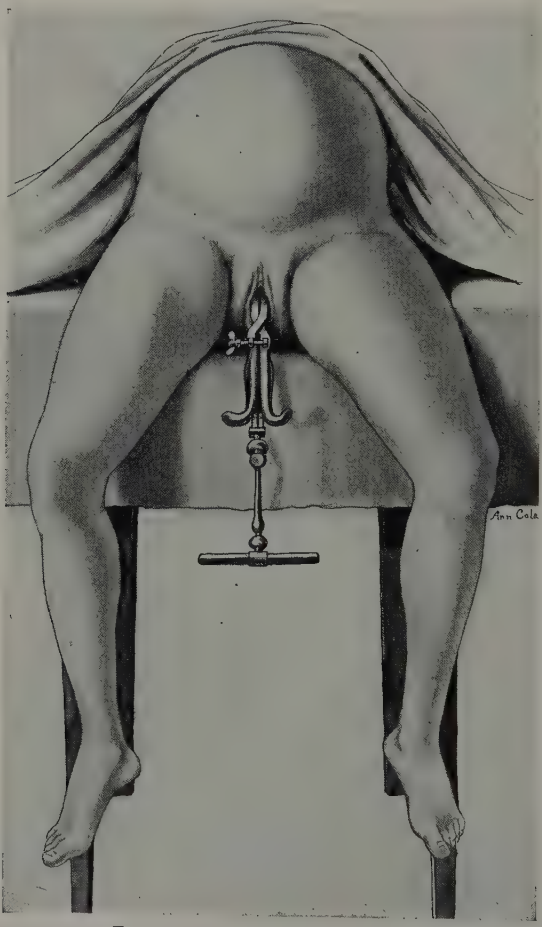


Fig. 6277.—The Application of Forceps, in Walcher's Position; – The accoucheur usually sits upon a stool, between the patient's legs. The Tarnier traction-forceps are here employed.

as much as possible (which may be done to the extent of between 6 and 7 mm. or $\frac{1}{4}$ inch), and the forceps are to be used at the pelvic brim. The patient rests with her buttocks over the end of the table, and her feet unsupported. The Accoucheur sits on a low stool, or on the floor, between her legs. As soon as the head passes the brim, the patient assumes the lithotomy position – as the Walcher posture also lessens the outlet.

Anesthesia: – Some form of anesthesia is usually employed during the introduction of forceps. Chloroform was formerly extensively employed. Ether

by the drop method, is probably the best. Forceps are frequently used without any anesthesia.

The method of applying forceps in general – as well as special applications of forceps – will be now considered.

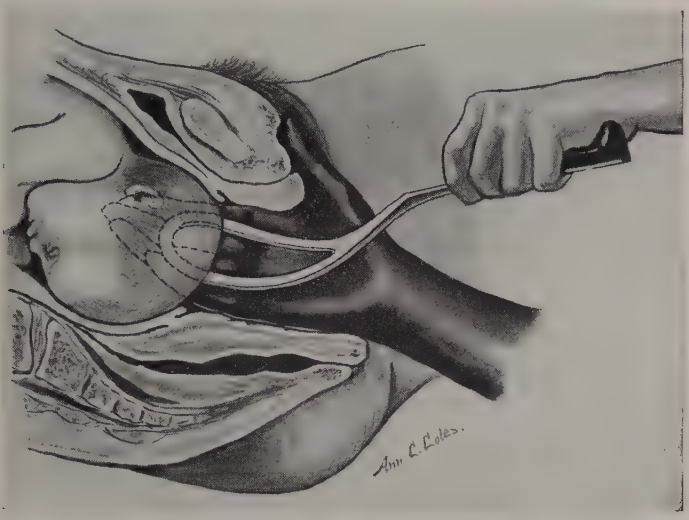


Fig. 6278.—Low Forceps; – Introduction of the first, or left blade. Guided by the right hand in the vagina, the left hand carries the left blade into position, between the left wall of the vagina and the presenting part.

Low Forceps Operation.—In applying the forceps, the blades are lightly and deftly held – not awkwardly and clumsily grasped. The left, or male blade, held in the left hand, is usually introduced first. Two or three fingers of the right hand are carried into the vagina, with the back of the fingers to its

Fig. 6279.—Method of Introducing Forceps Blades – the guiding hand passing between the vaginal wall and the blade.

left wall. The lower border of the left blade, convexity to the left, is pressed against the posterior vaginal commissure, as its tip glides into the vagina and along the surface of the fingers (Fig. 6278). The fingers within the vagina guide the blade to the cervix, and then within the cervix (Fig. 6278). As the

Fig. 6280.—METHOD OF INTRODUCING FORCEPS BLADES – the guiding hand passing between the child's head and the blade.

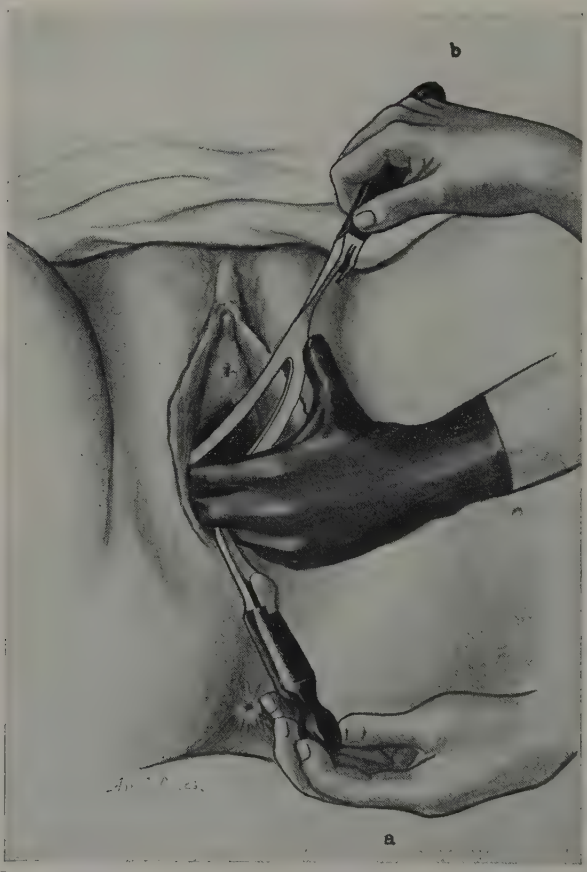


Fig. 6281.—LOW FORCEPS: – b, Introduction of the second, or right blade. The first blade, a, already introduced, is steadied by an Assistant. Guided by the left hand in the vagina, the right hand carries the right blade into position, between the right wall of the vagina and the presenting part.

blade passes upward and inward, its handle is lowered, as the blade traverses its curved, upward course – until, finally, the handle points obliquely toward

the patient's right thigh, coming to rest in a horizontal position – indicating the end of its course. Minor modifications are possible here. Either the blade may be introduced as just described. Or the blade and hand may be introduced simultaneously – being held in the relationship to each other as shown in Fig. 6279. Or the blade may be carried along the back of the hand – the tips of the fingers hugging the child's head, in passing through the cervix, and the forceps hugging the back of the fingers – until the latter, within the uterus, are withdrawn, for the blade to take their place (Fig. 6280). These various maneuvers are to make sure that the blade actually passes within the uterus, ready to grasp the head directly – and not simply up against the outside of the cervix – as has frequently occurred. For when this happens, and the blades are locked, the cervix is sometimes seriously traumatized between the head of

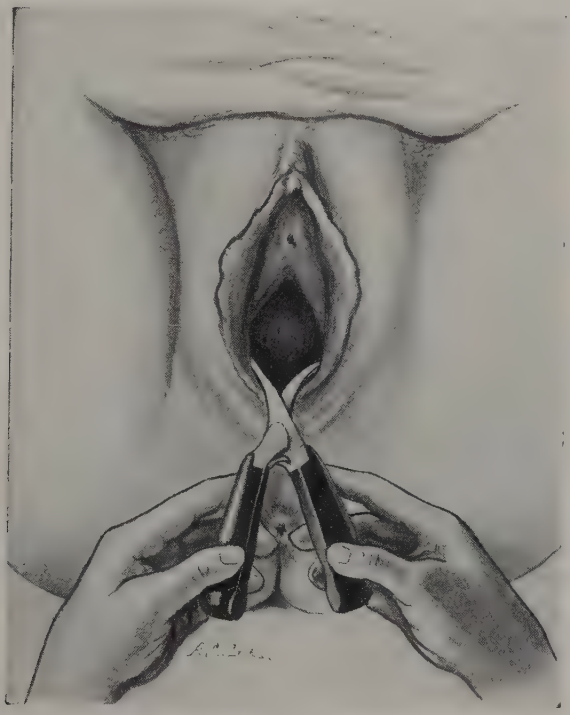


Fig. 6282.—Low Forceps – locking the blades

the child and the blade of the forceps. One must be prepared for the blade to make a longer inward and upper excursion than would at first seem likely. The handle of the first blade is often steadied by an Assistant, or Nurse, while the second one is being introduced – but this is generally unnecessary.

The second, right, or female blade is now introduced – the accomplishment of which is a little more awkward than the introduction of the first blade, independently of the fact that the handle of the first one is now within the vagina. The second blade is held in the right hand, while the same maneuver is carried out as was just practised with the first blade. Two or three fingers of the left hand, with dorsal surfaces toward the vaginal wall, traverse the right vaginal wall just in advance of the tip of the blade, or *pari passu* with it (Fig. 6281) – the entry through the posterior commissure being made directly over the handle of the first blade. This blade is carried into a symmetric position on the right,

within the cervix _ until its handle comes to rest correspondingly with the handle of the first blade, and in easy relationship with it.

Locking the blades, is the next step. This will be easy, or difficult to accomplish, in proportion as the handles lie in such relationship with each other as to indicate that each has been properly and symmetrically placed, with reference to the head and to each other. The half-lock of each blade should be ready to accurately meet its mate _ directly opposite, and pointing in the same direction. If not, some slight shifting of the blades, without withdrawing them, will usually bring them into such relations as to make their locking easy (Fig. 6282). There should be no locking by force _ the fact that it is necessary, shows that something is wrong. Sometimes it is indicated to withdraw both blades and introduce blades of other curve and length.

The condition of the child's heart should be known just in advance of applying forceps and then be examined immediately after their application. If such examination suggests that the cord has been compressed by the forceps,

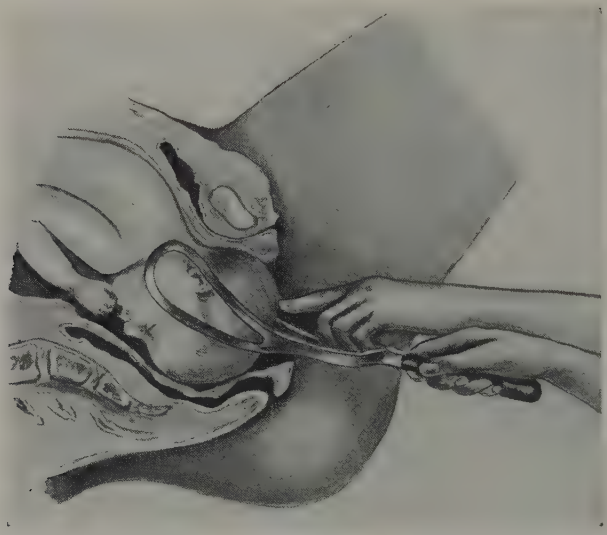


Fig. 6283.—Testing the Hold of the Forceps, in Making Traction, by Finger Contact.

they should be at once removed _ and readjusted with great care _ and under the guidance, if necessary, of the introduction of as much of the hand into the uterus as may be needed.

The hold of the forceps upon the head may be tested, before beginning the actual traction, by a slight pull of the handles, with one hand, while the fingers of the opposite hand, placed as seen in Fig. 6283, feel to see if the blades slip away from the head _ or keep their hold firmly.

Traction is now begun _ and should, as a rule, be made only during pains. If emergency require speedy delivery _ or if pains are insignificant, or negligible _ traction can be made for a minute at a time, two or three minutes apart. Between the acts of traction, compression upon the child's head may be relieved by unlocking the forceps. The guide for the direction of traction, is, that it must be made in the axis of that portion of the parturient canal through which the head is in the act of passing at the time of the traction _ which, necessarily, will be constantly changing, as the head makes its excursion. In low forceps cases, the traction is usually horizontal at its beginning _ rounding

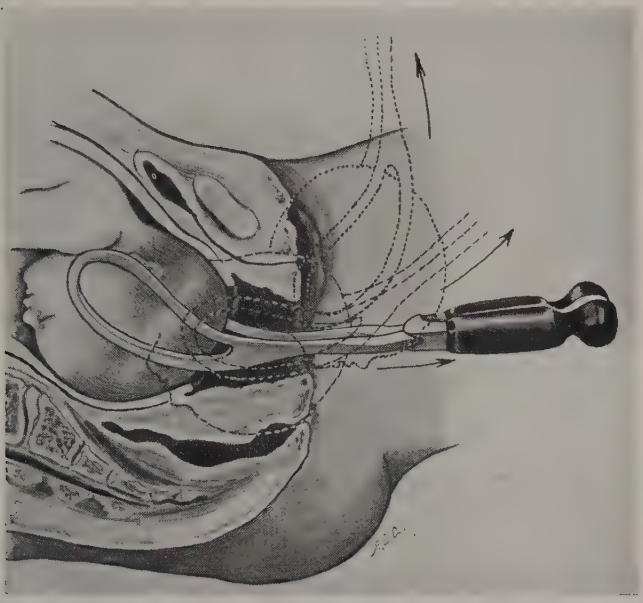


Fig. 6284.—Forceps Traction Technic, in Successive Positions of the Head, in Anterior Cephalic Presentations.

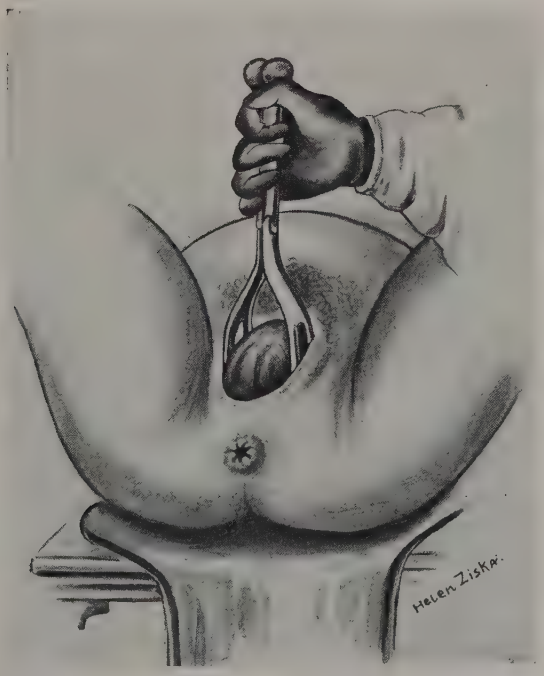


Fig. 6285.—Short Forceps – at the end of traction – about to shift the blades.

somewhat upward, in its middle phase – the forceps being directly still further upward toward the end. The successive directions of the traction are seen in

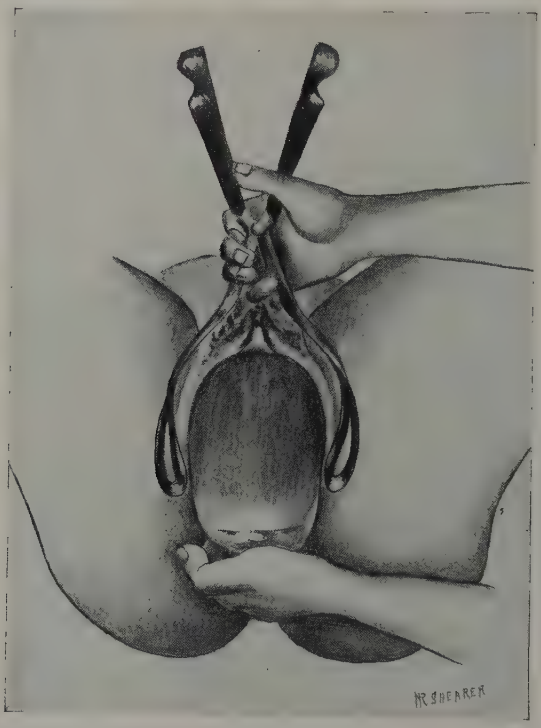


Fig. 6286.—Removal of Blades of Forceps Just Prior to Birth of Head.

Fig. 6287.—Application of Low Forceps, in Mento-anterior Face Presentations.

Fig. 6284. The position of the head and instrument near the termination of traction, is shown in Fig. 6285.

The rocking, or pendulum swinging of the forceps, is practised by some and condemned by others. A steady pull is practised by the majority.

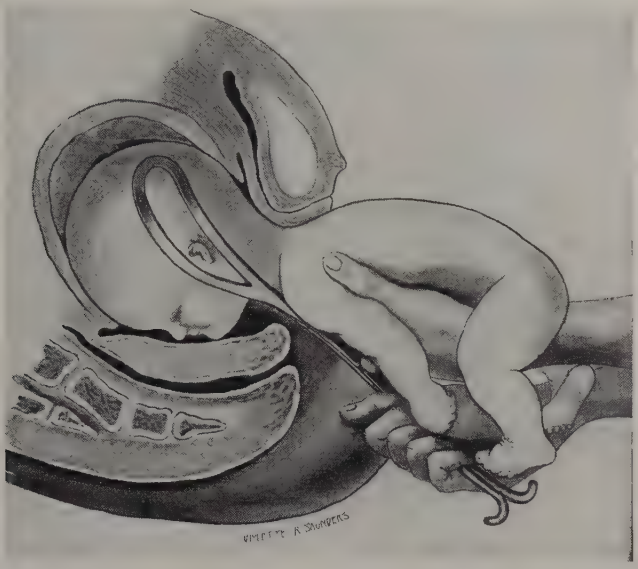


Fig. 6288.—Forceps Applied to After-coming Head, in Sacro-anterior Position.

Shifting the forceps immediately prior to the birth of the head (Fig. 6286) is the practice most commonly followed, though there is no fixity of rule. The best principle to follow is, that in roomy canals, as in multiparæ, the actual

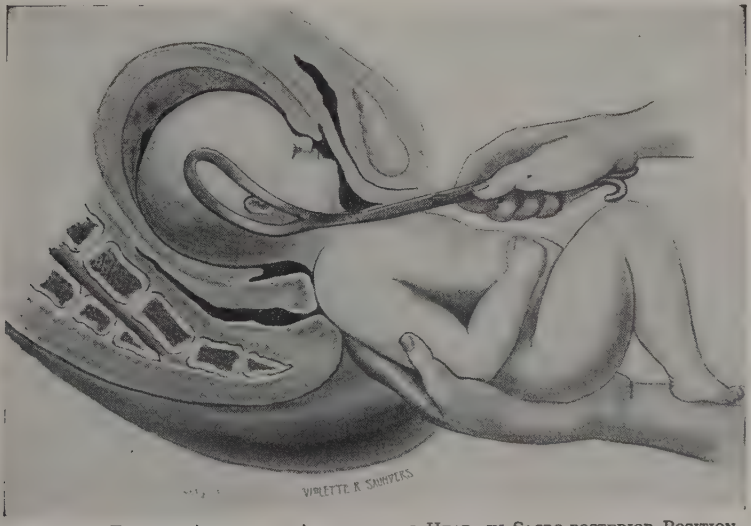


Fig. 6289.—Forceps Applied to After-coming Head, in Sacro-posterior Position.

need for shifting the forceps before the expulsion of the child is not as great as it is in the narrow passage of a primipara, where the forceps, added to the child's head, may make considerable difference in forcing the passage. In these latter

cases, it is well to remove the forceps just before the head comes through – but the blades must be removed sufficiently in advance – for if an attempt be

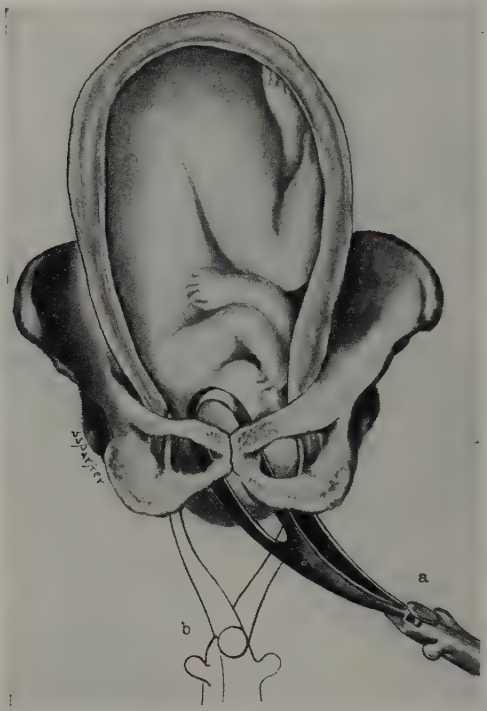


FIG. 6290.—APPLICATION OF MIDFORCEPS WITH REFERENCE TO HEAD AND TO PASSAGES: – **a, Cephalic application, adapting blades to head; – b, pelvic application, introduction along pelvic walls, grasping head irrespectively of adaptation of concavity of forceps to head's convexity.**

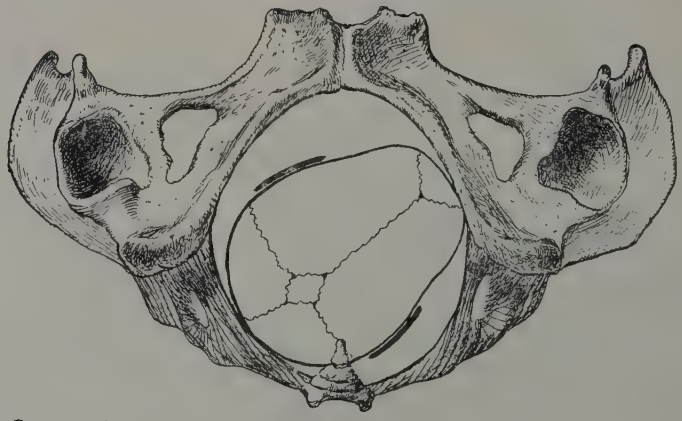


Fig. 6291.—CEPHALIC APPLICATION OF FORCEPS – the blades adapting themselves to the convexities of the head throughout.

made to remove them when the tension is at the highest, matters are apt to be made worse than they would be if left undisturbed.

Other applications of forceps at or near the outlet, are seen in Figs. 6287–6289.

Fig. 6292.—Midforceps; – Introduction of the first (the left, or the male) blade. Guided by the right hand in the vagina, the left hand carries the left blade into position, between the left vagino perineal wall and the presenting part.

Fig. 6293.—Midforceps; – Introduction of the second (the right, or female) blade. The blade already introduced is steadied by an Assistant. Guided by the left hand in the vagina, the right hand carries the right blade into position between the right vaginoperineal wall and the presenting part.

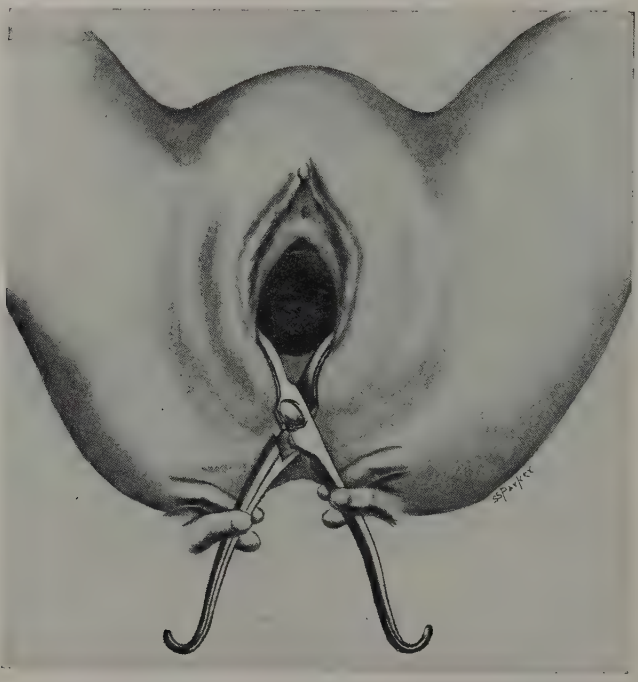


Fig. 6294.—Introduction of Midforceps – locking the blades.

Fig. 6295.—Midforceps – practising traction downward and forward, upon the locked forceps.

Median Forceps Operations.—The application of the forceps is here, as might be expected, somewhat more complex than in the low operation – not only because the head is higher in the pelvis, but also because instead of lying

in the easy anteroposterior diameter of the outlet, it is due to be found in one of the oblique diameters – or even still in the transverse diameter – and its contact with the bony walls of the pelvis is more intimate.

Two methods of applying median forceps are employed (Fig. 6290): – Cephalic application – in which an effort is made to grasp the sides of the fetal head with the forceps – is the method of choice – and involves both the mother and child in less danger; – Pelvic application – in which the forceps are applied

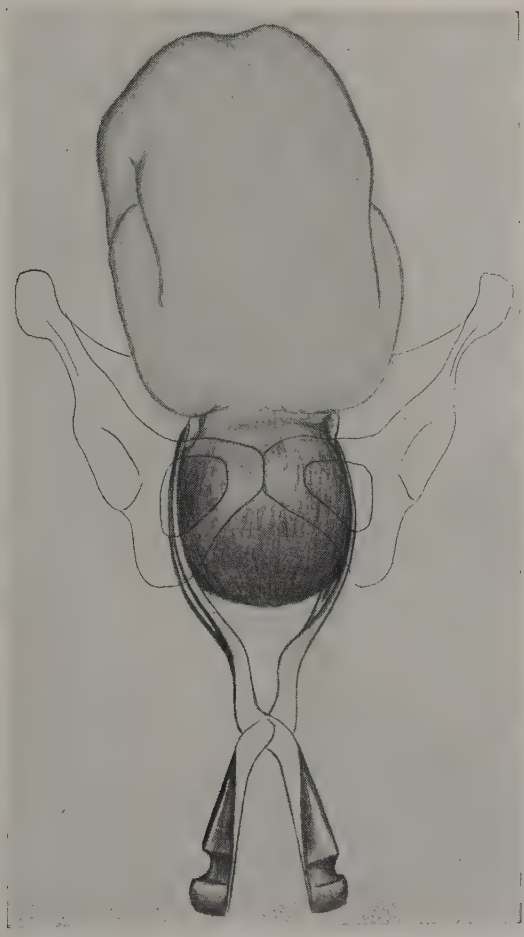


Fig. 6296.—Application of Midforceps, with the Head in the Antero-posterior Diameter

with reference to the sides of the mother's pelvis, without reference to what relationship this brings them to the child's head.

(*a*) Cephalic Application of Median Forceps (Fig. 6291): – The forceps here compress the head in the biparietal diameter – which is their best adaptation – the means of their securing the best hold and control – and the method for which least room is required. In, for instance, left occipito-anterior presentation, pass the fingers of the right hand (dorsal aspects outward) into the vagina and through the cervix (Fig. 6292) – and then guide the left blade of the forceps,

with the left hand well into the space between the child's head and the mother's left sacro-iliac synchondrosis – when it is given to an Assistant to steady. In similar manner the right forceps blade (Fig. 6293) is passed up between the head and the right wall of the pelvis, toward the right sacro-iliac synchondrosis – and is brought forward, along the right pelvic wall, until near the right obturator foramen. This maneuver brings the right blade over the right ear of the child, and opposite the left blade – and is accomplished by the combined manipulation of the fingers within the vagina, through the depression, rotation, and carrying of the forceps handle to the left. The cervix must be well dilated

Fig. 6297.—Application of Midforceps, with the Head in the Left Oblique Diameter.

before the forceps are introduced. The blades thus grasp the head in a biparietal hold (Fig. 6294). The blades are carefully locked – without strain – and traction is made, at first, slightly downward and backward (Fig. 6295) – following throughout traction in the axes of the different pelvic planes through which the head is descending. Rotation by forceps, should be made, if at all, with extreme care – and with absolute certainty of the correctness of the direction in which it is being made, and position of the child's head.

The cephalic application of midforceps with the head in different diameters, is seen in Figs. 6296–6298.

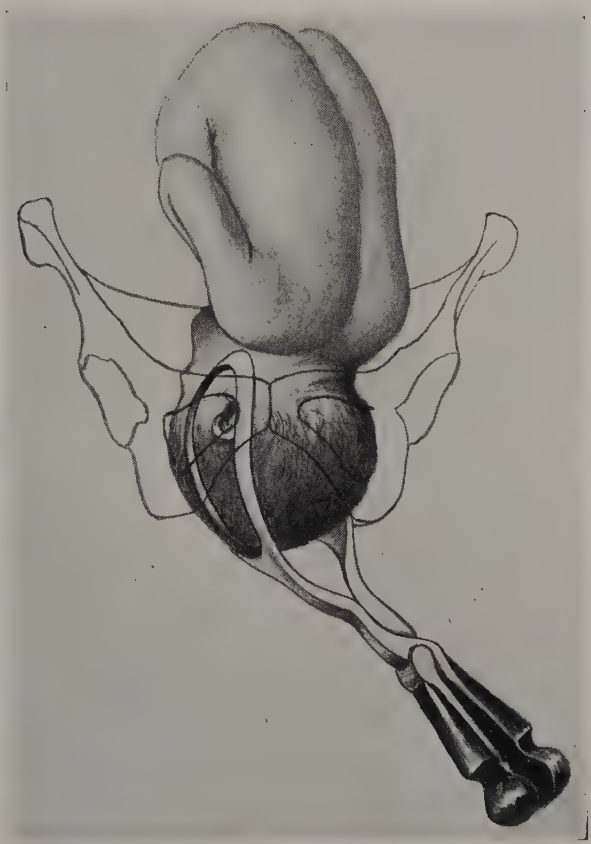


Fig. 6298.—Application of Midforceps, with the Head in the Right Oblique Diameter.

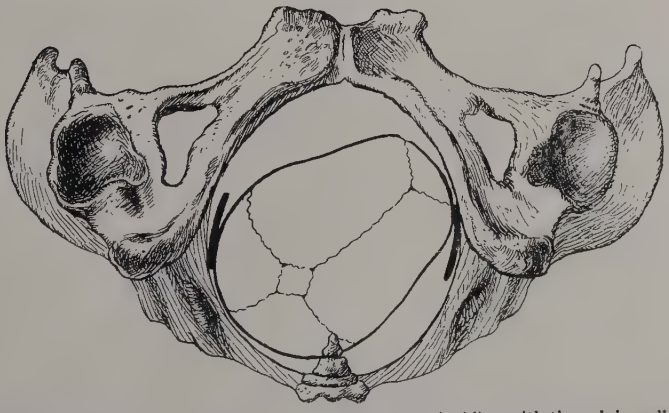


Fig. 6299.—Pelvic Application of Forceps – the blades coinciding with the pelvic walls and curves, irrespectively of the position of the head. Only opposite margins of each blade are seen to bind the head.

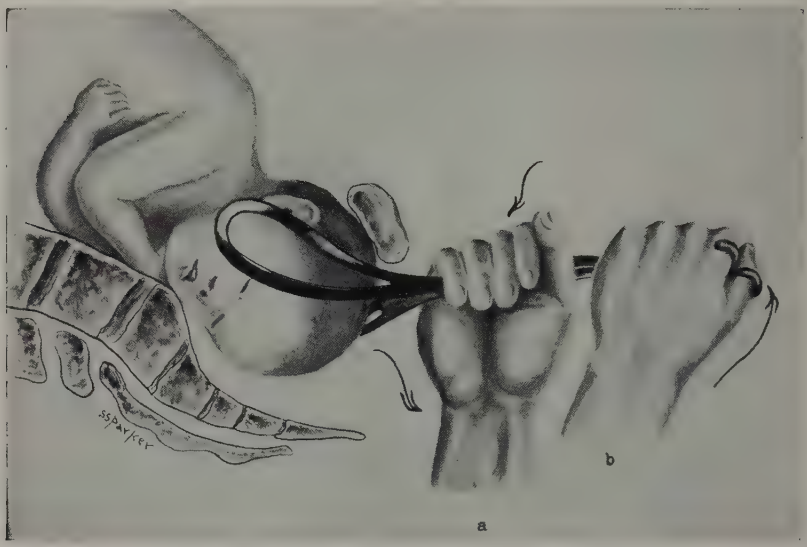


Fig. 6300.—Pajot's (Osiander's) Technic in Forceps Delivery; – Downward pull of the hand a, serves as a reversed fulcrum, around which the forceps are made to partially revolve by upward pressure of the hand, b, – thus simultaneously dislodging the head and drawing it downward and forward. The same result may be accomplished by reversing the position of hand, a, pressing down upon the forceps from *above*.

Fig. 6301.—Relation of Blades of Forceps; – left blade, held by left hand, introduced along left wall of pelvis, and guided by the right palm; – right blade, held by right hand, introduced along right wall of pelvis, and guided by the left palm.

(*b*) Pelvic Application of Median Forceps: – In this method the temple of the child is grasped with one forceps blade – and the opposite parietal protuberance, by the other (Fig. 6299) – and when the head has rotated, the forceps are removed from the first position – and upon their re-application, grasp the sides of the head. No hasty traction should be made – but the head should be allowed to descend and recede, and to rotate – within all that is reasonable.

The Pajot-Osiander technic in forceps delivery, is shown in Fig. 6300.

High Forceps Operation.—The patient should be upon a table of ordinary height – and under anesthesia – and brought, at the time of operation, into the exaggerated lithotomy position, at the end of the table. The head is entering the pelvic brim in the transverse diameter – and the forceps are usually only capable of being applied to the occiput and sinciput, respectively. The left forceps

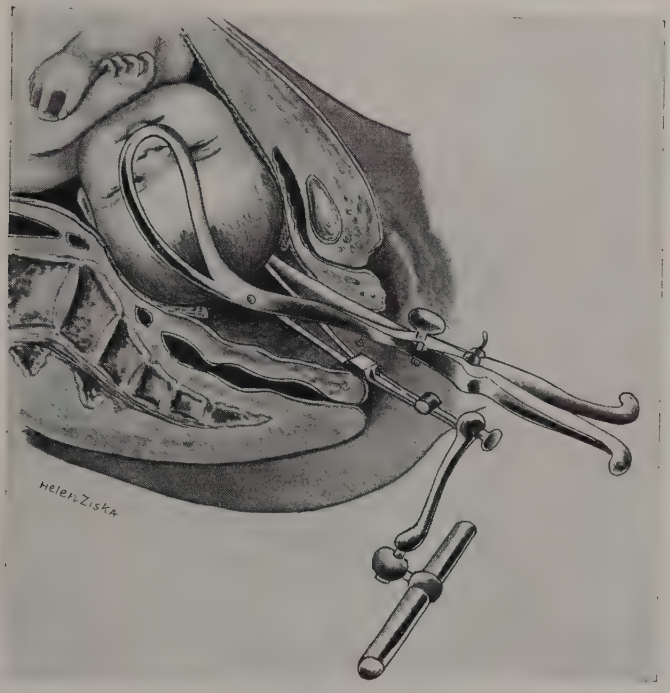


Fig. 6302.—Axis-traction Forceps (Tarnier's), Applied at the Inlet.

blade (Fig. 6301) is carried in the palm of the right hand along the left pelvic wall (being careful to keep inside of the thinned uterine lip) – and is adjusted, by the fingers of the guiding hand, to the pole of the fetal head (occiput or sinciput) in contact with the left pelvic brim. Reversing this technic, the right forceps blade is then carried in the palm of the left hand, along the right pelvic wall – and is adjusted to the opposite pole of the head in contact with the right pelvic brim. The blades are now locked, without force. Traction is first made tentatively, to learn if the grasp be satisfactory (Fig. 6302), and then firm traction is made downward and backward, in the direction of the perineum. The handles of the forceps begin to sweep upward and forward, as the head enters the pelvis. As the head rotates in the pelvis the handles of the forceps approach each other – when the forceps should be removed – and be applied to the sides of the head.

Some Applications and Usages of Long Forceps are shown in Figs. 6303–6312.

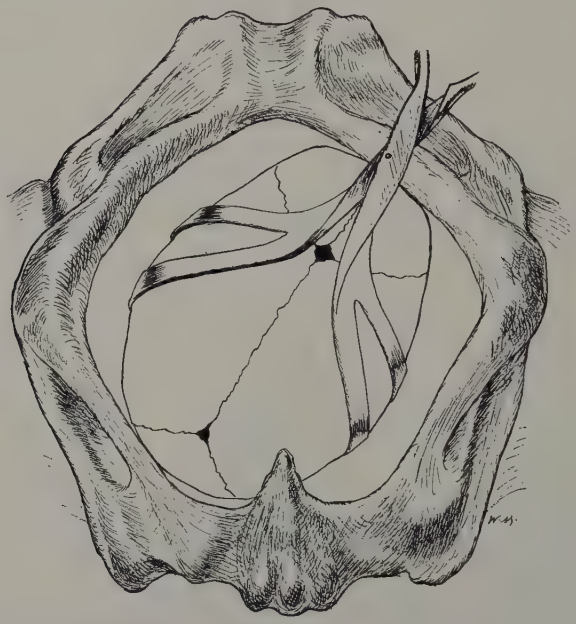


Fig. 6303.—Scanzoni's Technic with Long Forceps, in Right Occipito-posterior Position; Application of forceps.

Fig. 6304.—Scanzoni's Technic with Long Forceps in Right Occipito posterior Position; Adjustment of forceps.

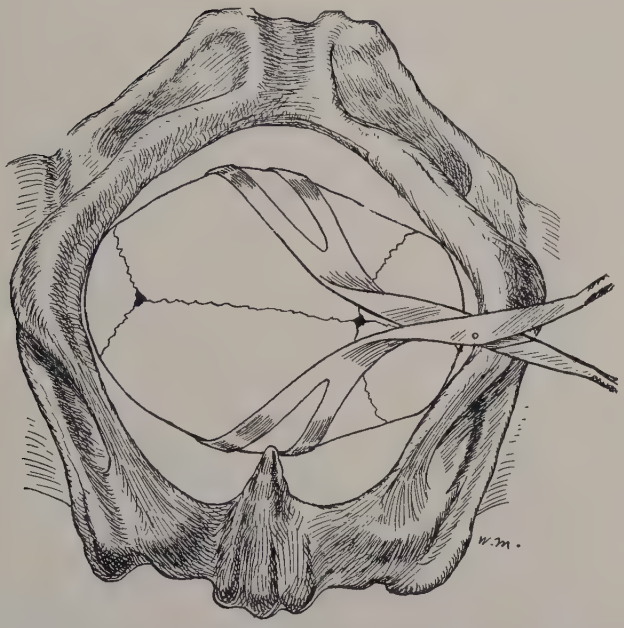


Fig. 6305.—Scanzoni's Technic with Long Forceps, in Right Occipito-posterior Position; – Rotating head to right occipito-transverse position.

Fig. 6306.—Scanzoni's Technic with Long Forceps, in Right Occipito-posterior Position; – Rotation around the right pelvic wall, to the transverse position.

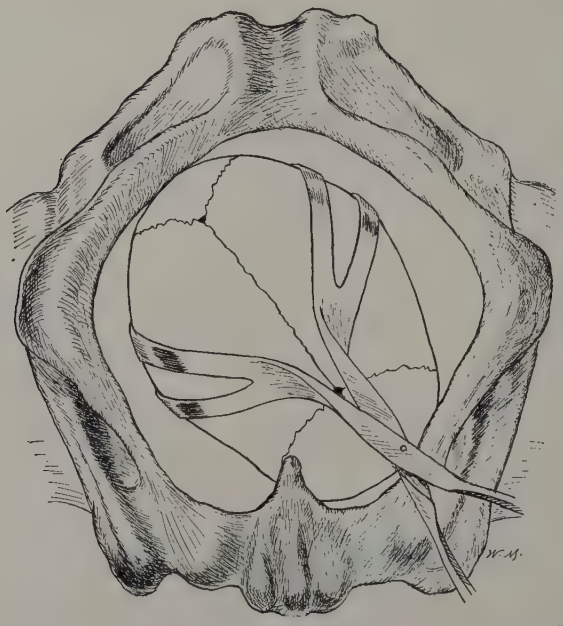


Fig. 6307.—Scanzoni's Technic with Long Forceps in Right Occipito-posterior Position; – Rotating head to right occipito-anterior position – concavity of forceps looking obliquely backward.

Fig. 6308.—Scanzoni's Technic with Long Forceps, in Right Occipito-posterior Position; – Rotation continued around the right pelvic wall, to the right occipito-anterior position.

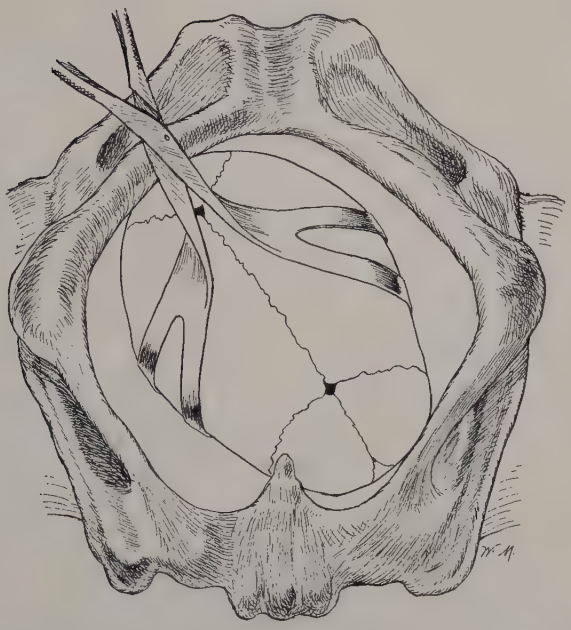


Fig. 6309.—Scanzoni's Technic with Long Forceps, in Right Occipito-posterior Position;—Readjustment of forceps in right occipito-anterior (rotated from right occipito-posterior), so that concavity now looks obliquely forward.

Fig. 6310.—Scanzoni's Technic with Long Forceps, in Right Occipito-posterior Position;—Readjustment of forceps in right occipito-anterior position (rotated from right occipito-posterior position), so that concavity now looks obliquely forward.

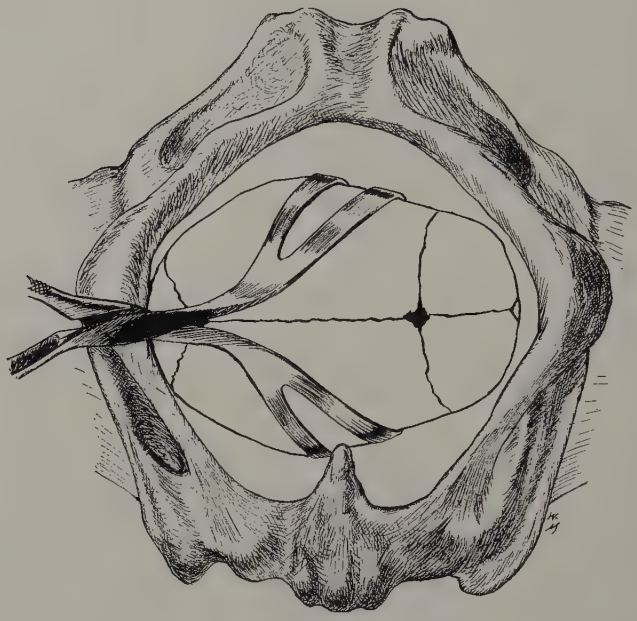


Fig. 6311.—Long Forceps – applied in right occipito-transverse.

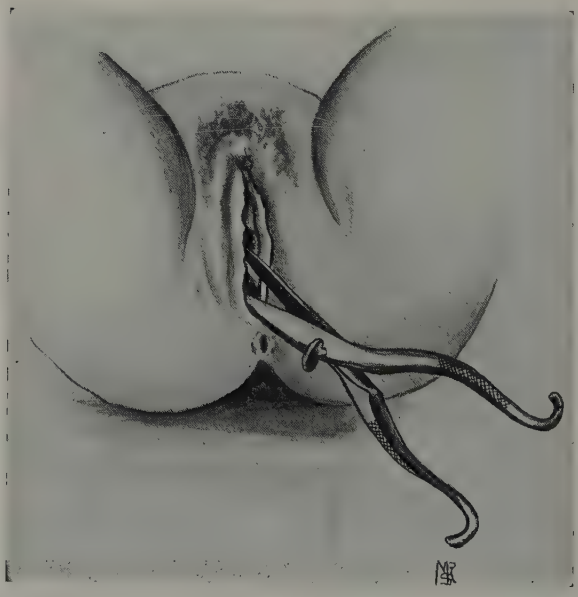


Fig. 6312.—Long Forceps in Right Occipito-transverse Position; – application of forceps.

OPERATIONS FOR THE INTRA-UTERINE DESTRUCTION, CRUSHING, SECTION, AND EXTRACTION OF LIVING CHILDREN _ AND FOR THE CRUSHING, SECTION, AND EXTRACTION OF DEAD CHILDREN

The ultimate object of all of these procedures, is one and the same _ to remove the child from the mother _ but the child often cannot be removed, unless its bulk be made smaller, or altered _ crushed, or dismembered _ and these, in turn, cannot be done until its life is first destroyed _ so that destruction of life, when it still exists, is the initial point of this unfortunate cycle.

It must always be a matter of both individual judgment and conscientiousness to decide upon the warrantability of human destruction _ independently of formulated rules for guidance in cases of generalization. It is universally felt that the welfare of the mother must outweigh the welfare of the child.

Indications for the destruction and dismemberment of the child are felt to be present _ if the child be dead or apparently dying _ if the child be markedly deformed _ if unsuccessful attempts have been made to deliver it _ or if the mother's condition, local or general, be such as to be endangered while, at the same time circumstances are such, physically or as to surroundings, as to make it unwise to subject her to an abdominal cesarean section.

If it seems unlikely that the child can be born alive _ if the mother's condition be good _ and local conditions and accessories appropriate _ then it goes without the saying that cesarean section represents the maximum that can be done

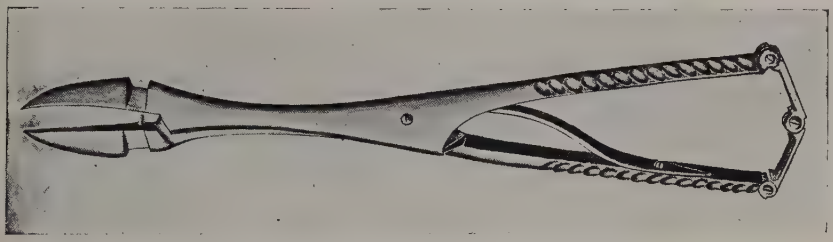


Fig. 6313.—Simpson's Cranial Perforator.

for the child. From the standpoint of the mother's welfare, then it becomes solely a matter of judgment to decide whether her own chances are better with dismemberment and extraction of the child, or by cesarean section. With modern improvements, abdominal cesarean section, in good hands, is considered by many, in the majority of instances, to offer a better chance even to the mother than does dismemberment and extraction.

Destruction and dismemberment of the child is usually not undertaken when the true conjugate diameter of the pelvic inlet is less than 6.3 cm. ($2\frac{1}{2}$ inches).

All steps are conducted with extreme care against injury and infection. Anesthesia is used.

Several different methods of destruction, dismemberment, and extraction are employed _ some of the chief of which will be here given. (The designations craniotomy, embryotomy, and the like, should be discarded.)

It will be understood that all preliminaries have been covered _ that the presentations have been diagnosed _ the parts prepared _ the bladder and rectum emptied _ the cervix dilated _ and that only the immediate technic bearing upon the destruction and removal of the child is being considered.

(*a*) **Destruction of the Fetus by Cranial Perforation.**—This technic has solely to do with the destruction of life _ having nothing to do with the removal of the child. The object sought is to destroy the vital center of the

medulla _ the removal of the dead child then being accomplished by some modification of special forceps, usually termed a cephalotribe, or cranioclast.

The form of cranial perforator usually employed, is that of Simpson (Fig. 6313). Its especial feature is the destruction caused by the separation of the blades, within the brain, giving it a greater range of destructiveness. It should be distinctly sharp, so as not to slip. Championière's cranial hand-burr (Fig. 6314) _ is dependent, upon the other hand, upon being driven

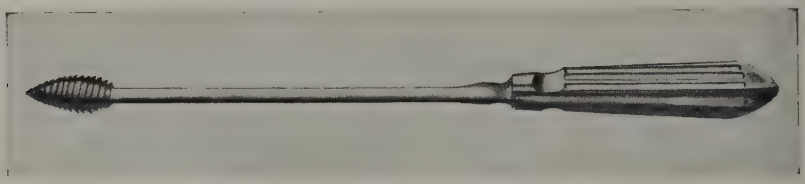


Fig. 6314.—Championière's Cranial Perforator.

directly home to a vital center, such as the medulla _ to make sure, the breaking up of both the medulla and the base of the brain _ rather than run the risk of having a partially destroyed child subsequently delivered, as has happened.

The head should be held in position during perforation _ and, indeed, the presenting part which is being attacked, in this entire category of cases, should be steadied firmly and safely _ for instruments, under pressure, have slipped

Fig. 6315.—Perforation of the Skull with Simpson's Cranial Perforator.

from their original sites and done great damage. It is entirely conceivable that an instrument glancing from the scalp, may pass entirely through the uterine wall, and tear open intestines and large vessels. The part being operated upon, therefore, should, whenever possible, be steadied in a twofold manner _ by the two hands of an Assistant, pressing the part downward through the abdominal wall _ and by toothed vulsellum forceps, grasping the

part through the vagina – thereby minimizing the chances of slipping – which are not even then entirely removed. In proportion as the presenting part is wedged and immovable, will counterpressure be less indicated – except to anticipate sudden dislodgment of the part.

In using the Simpson instrument, it is guided to its position of penetration by the first two fingers of the Operator (Fig. 6315) until the points of its closed blades come into right-angled contact with the presenting part of the skull. It is then bored and pressed directly through the scalp and skull, into the brain, up to its shoulders, and then turned and separated in different directions. No attempt is made to penetrate a fontanel. The openings made directly through the membranous bones remain more patulous better than those through the fontanels. Finally, after several openings in different directions, at the shoulder level of the instrument, its blades are closed, and the instrument is carried downward, or onward to destroy the base of the brain, and especially the medulla oblongata (Fig. 6316).

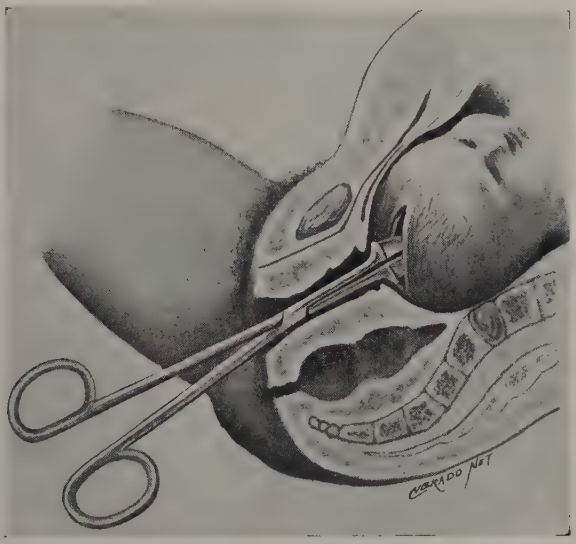


Fig. 6316.—Entering the Blades of the Bibladed Perforator, Preparatorily to the Act of Destroying the Medulla Oblongata.

While what has been said, as to perforating the presenting part of the head at a right angle to the surface presenting, is, in the main true – yet, naturally, there are certain points of preference for puncturing – both from the standpoint of destroying the child, and from that of its subsequent removal – but whether these can be conveniently reached or not as the sites of initial entry, the direction of the ultimate goal of the instrument should be the life center – the base of the brain and the medulla oblongata.

In vertex presentations, perforation will usually be made in the vicinity of the anterior or posterior fontanel – in brow presentations, through the frontal bone, or at the junction of nasal and frontal bones, or an attempt may be made to convert it into a vertex, or into a face, and then perforate it as such – in face presentations, through the orbit, or through the mouth – in the after-coming had, following breech deliveries, through either the posterolateral fontanel, posterior to the ear (Fig. 6317), or through the occipital bone; or through the floor and roof of the mouth and roof of the nose.

Other bearings, as to the selection of the point for perforation, considered from other standpoints than those of the speediest and most certain destruction of the child (which, of course, are the most important ones, next to the preservation of the mother), have to do both with the influence of evacuation at certain points upon the subsequent flexion of the part, or traction upon it, in delivery – and as furnishing an opening through which one blade of, for instance, such an instrument as the cranioclast may pass in grasping the part for the removal of the child. All of these bearings should be borne in mind during the various procedures, and perforation accomplished where the most advantageous measurements of the child will be secured, for following flexion, or instrumental extraction.

Attempts have been made to perforate the pelvis through the anus, in breech cases, and decrease the size by accomplishing evacuation, or evisceration of the abdominopelvic contents through this route.

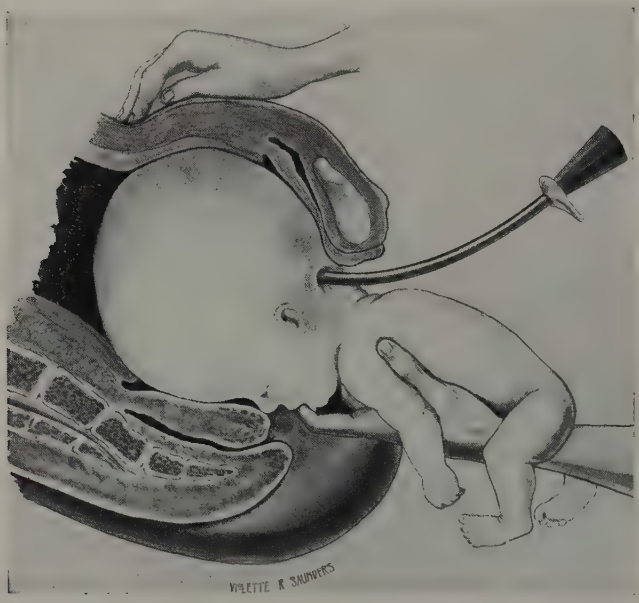


Fig. 6317.—Puncturing a Hydrocephalic Skull, Obstructing Labor; – A finger of the supporting hand is practising oral traction, to aid the pelvic forces in collapsing the skull emptied of its fluid. A large trocar and cannula are here used.

Extreme care is required in all manipulations that sharp projections of the child's bones will not be so left as, by any possible chance, to wound the parts of the mother in the act of extraction.

After the brain has been broken up, its removal is usually accomplished by irrigation. A two-way catheter, of fairly large caliber, is conducted into the cranial cavity – and it is often possible to irrigate away a sufficient amount of the brain contents to enable the cranial bones to collapse – thereby sometimes accomplishing sufficient reduction of size for the delivery of the head without resorting to any method of subsequent crushing.

Perforators of the scissors and trephine type are sometimes used.

The mother's sacral promontory has several times been mistaken for the child's head, in undertaking perforation.

It is often necessary to perform crushing, following perforation, together with instrumental delivery (v. p. 857)

(*b*) **Crushing and Extraction of the Destroyed, or Already Dead Child, in General.**—When the contents of the skull have been disorganized by the special instrumentation adopted, and largely removed by irrigation. Its size may or may not be diminished – which is the ulterior object – without any further act – that is, the pelvic forces alone may so compress the largely emptied skull as to cause its collapse – and its spontaneous expulsion may follow. The last act, however, only exceptionally occurs – and even the collapse is not apt to take place alone – but to require some active form of crushing (cranioclasis, or comminution of the skull within the scalp, as it is termed, when crushing is applied to the skull alone) – after which, the partially eviscerated skull, which has been crushed, must, in turn, be delivered by traction. This extraction may be sometimes accomplished with ordinary forceps, or with a crotchet – but very much more technically with a special form of instrument of the obstetric forceps type – a cephalotribe – or a cranioclast.

The pelvis of the child is sometimes crushed – as well as the head – especially in cases of deformity of either mother or fetus – in order to secure better fetal measurements for the pelvic outlet than the deformed pelvis may present.

(*c*) **Crushing of the Dead, or Destroyed Child – and its Extraction – by the Cephalotribe.**—The cephalotribe (Fig. 6318) is a special and heavy type

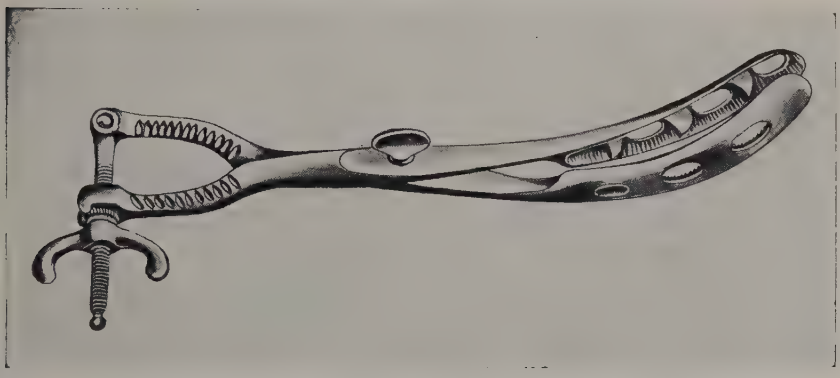


Fig. 6318.—Tarnier's Cephalotribe.

of obstetric forceps, originally devised for crushing the head, without previous perforation (the brains oozing from the eyes, nose, and mouth) – but now employed in the dual rôle of crusher and tractor – first crushing, or comminuting the cranial bones within the unbroken scalp, and then at once extracting the crushed head without changing its hold. Owing to the sometimes resistant bones of the head, an instrument much stronger than ordinary obstetric forceps is necessary. Both blades are exactly the same in shape and size – and generally interlock, the one within the compass of the other – whereas one blade of the cranioclast is small enough to fit flush in with the other. Used as a cephalotribe alone, its function is to perform cephalotripsy – to which has been added its additional function of tractor, or extractor – apart from that of lessening the size of the skull by fragellation and compression.

The general method of applying the blades of the cephalotribe is the same as in using obstetric forceps, as far as the principles and precautions are concerned – both blades being applied to the opposite aspects of the outer side of the head, or part (in contrast with the use of the cranioclast). The unlocked male and female blades are adjusted separately, the latter usually first, and then locked and tightened. It is essential that the blades encompass the

greatest girth of the part – and maintain it – as they are apt to slip, especially in the cases of deformity, where they are frequently used. The blades will often have to grasp the head, or part, above the pelvic brim – being guided into position, as far as they will reach, by the fingers of the left hand – and after having seized the head in some unusual position, it may be necessary to rotate the crushed head through either the transverse diameter of the inlet – the oblique diameter of the cavity – or the anteroposterior diameter of the outlet – following the roomiest diameters of the parturient canal with greater freedom, as far as the fetus is concerned, than if dealing with a living child (Fig. 6319). The powerful leverage of the heavier instrument gives one considerable power – whose chief care, now that the child is dead, is to preserve the mother – especially guarding her soft parts against the damage, sometimes serious, which might be committed by projecting pieces of the child's crushed bones.

The cephalotribe should have a scale upon its handle, or other guide, which will enable the distance between the ends of its blades to be always known.

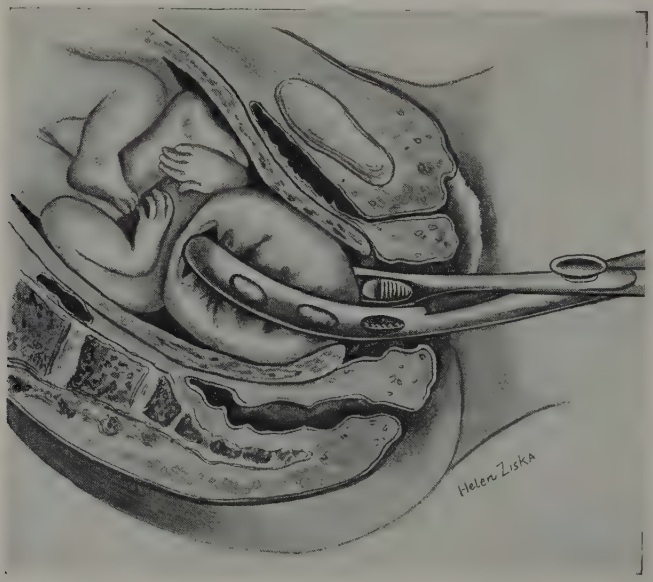


Fig. 6319.—Cephalotribe, Applied Anteroposteriorly in a Head Presentation.

Examination should be made, by finger, at intervals, to see that the blades are holding where placed.

As the instrument is heavier than the ordinary forceps, even additional care must be exercised against traumatizing the soft parts of the mother.

Though the part may be somewhat shifted by the cephalotribe in its passage through the various maximum diameters, yet final delivery should always take place with the axis of the instrument's curve corresponding with the general axis of the parturient canal. It will sometimes happen that the position of the cephalotribe must be shifted, from the hold originally taken, to a new hold, in the progress of delivery.

The chief present-day use of the cephalotribe is to accomplish cranial comminution, after destruction of life by the perforator, and before applying the cranioclast as a tractor – for while the cephalotribe is a tractor, the cranioclast (Fig. 6321) is generally considered to be a better tractor – or to seize the

base of the skull, in those cases where the cranioclast has torn off the upper portion.

It is to be remembered that the part is not to be dragged through the parturient canal, but to be manipulated through and that at times, even, the blades may be withdrawn and spontaneous expulsion be allowed.

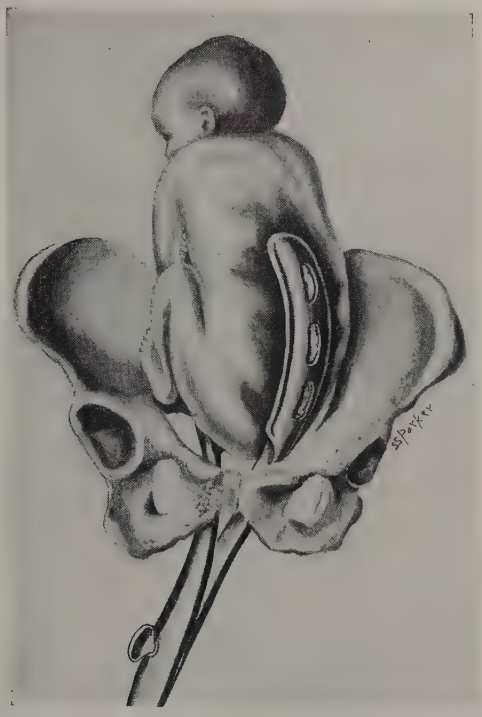


Fig. 6320.—Use of Cephalotribe in Obstructed Breech Presentation

The cephalotribe is also used in crushing the breech (Fig. 6320) and the instrument may be used as forceps are in high and low cephalotribe cases and to the after-coming head.

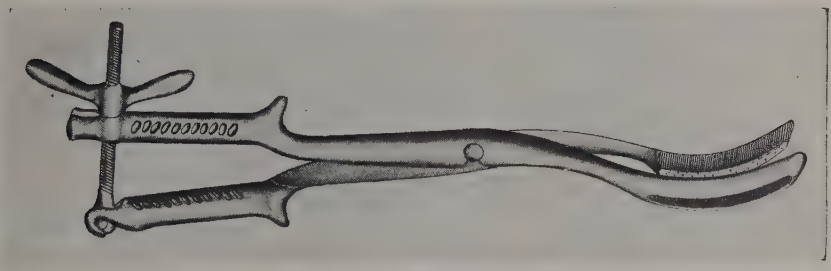


Fig. 6321.—Veit's Cranioclast.

The spinal canal is sometimes opened in the neck, and the cerebral contents expressed by cephalotripsy (Fig. 6317).

(*d*) **Crushing of the Dead, or Destroyed Child and its Extraction by the Cranioclast.**—The cranioclast (Fig. 6321) is an instrument, of the

obstetric forceps order, used to crush the bones of the head _ and, at the same time, is employed as a tractor, or extractor, whereby the crushed head, or part, along with the rest of the child, is delivered. The instrument is only employed after life has been destroyed by the perforator (v. p. 853) _ one of the blades, the solid one, being carried into the skull, through the opening made by the perforator _ and the other, the fenestrated blade, being applied to the outer side of the scalp _ traction being applied by approximating the inner and outer blades, which, between them, grasp the skull and scalp upon one aspect of the head _ the outer blade sinking into the scalp and skull until

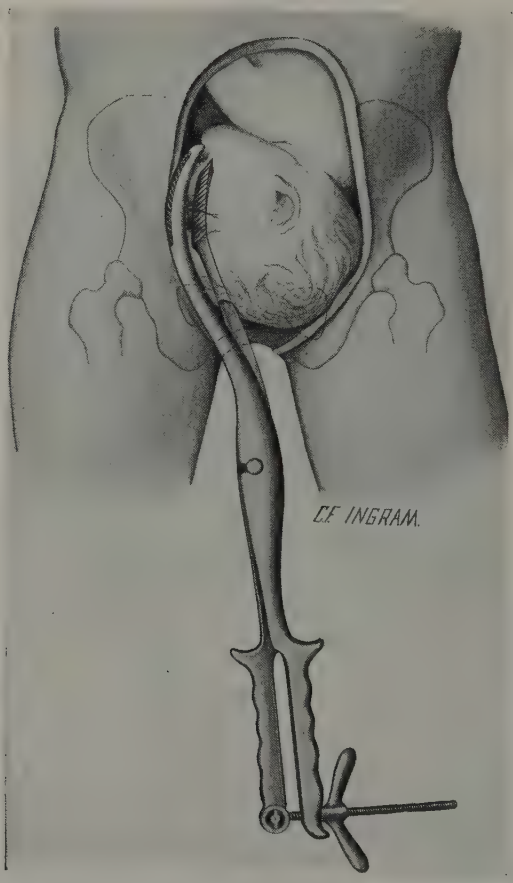


Fig. 6322.—Braun's Cranioclast, Applied to the Front of the Head.

practically flush with them, and the inner blade occupying, of course, no room of its own (being within the skull). It will be thus seen that traction is made entirely upon the structures of one side of the head _ and not evenly, against the outer scalp surfaces of opposite aspects of the head.

The chief function of the cranioclast is as a tractor _ the cephalotribe is a better crusher. The form of crushing which the cranioclast does is much more limited than that done by the cephalotribe _ sometimes tearing off a piece of the crushed bone of the one side.

The cranioclast is capable of delivering a head through a smaller passage

than a cephalotribe – takes up less room – can usually be more advantageously manipulated – and generally takes a firmer hold, as a tractor. It is also used as a breech tractor, as well as a cranial tractor.

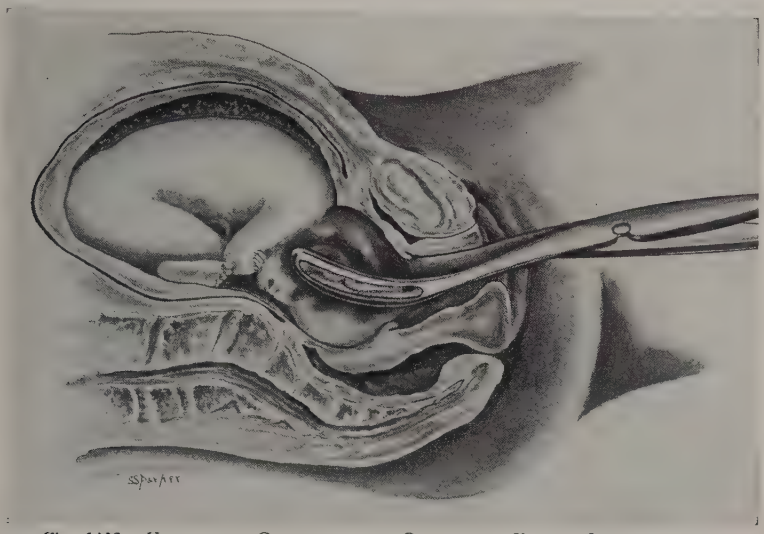


Fig. 6323.—Use of the Cranioclast in Obstructed Vertex Presentation.

The method of using the cranioclast is as follows: – The brain is first perforated, destroyed, and as much of its bulk irrigated away as possible – then,

Fig. 6324.—Application of the Cranioclast to the After-coming Head.

guided by two fingers of the left hand, the solid blade of the instrument is carried into the skull, through the opening made by perforation – and, while this is steadied in position, the fenestrated blade, guided by the fingers of the left

hand, is carried along the outer aspect of that side of the skull which it is desired to grasp. The blades are then pressed firmly together, until, by sinking into each other, they occupy the minimum space—and are then locked—after which traction is made upon them, upon the same general principles as in manipulating forceps (Figs. 6322 and 6323).

In dealing with an after-coming head, the solid blade is introduced through the same occipital opening in the skull that was made to admit the perforator (Fig. 6324).

In using the cranioclast in breech cases, the solid blade is carried up the rectum (Fig. 6325).

A somewhat different use of the cranioclast is made by some Operators—one which it would seem unwise to adopt—though endorsed by good men:—The solid blade is carried into the cranium, and the fenestrated, between the scalp and the skull. The blades are then locked—and the grasped piece of

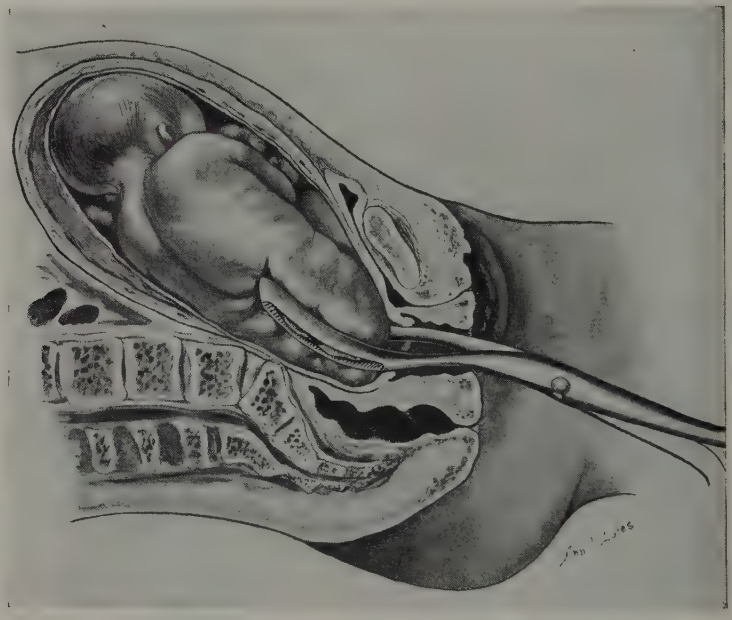


Fig. 6325.—Use of Cranioclast, in Breech Case.

bone wrenched away and twisted—and, held by the instrument, and guarded by the fingers, removed. As much as deemed necessary, of the frontal, parietal, and occipital bones is, in turn, thus removed. The technic is shown in Fig. 6326. When the bones of the vault are removed, the chin is brought forward, causing the face to present—after which, a crotchet is fixed in the mouth, nose, or orbit, and the child removed—or, at this stage, the cranioclast can be reapplied simply as a tractor, and accomplish its removal.

(*e*) **Perforating, Crushing, and Extracting—by Means of the Basiotribe.**—This instrument (Fig. 6327) represents the combination of perforator and cephalotribe, in one—first perforating, then crushing, and finally extracting the head. The three-bladed instrument is used as pictured in Fig. 6328. The detachable middle blade, the perforator, is used in the same general manner as any other perforator—and, after destroying life and disorganizing the brain, it is twisted into the foramen magnum of the child—a

procedure said to be practically simpler and safer than conveyed in idea. If possible to do so, it is best to place the first one of the outer blades over the face – and the second over the occiput – guiding them into position by the

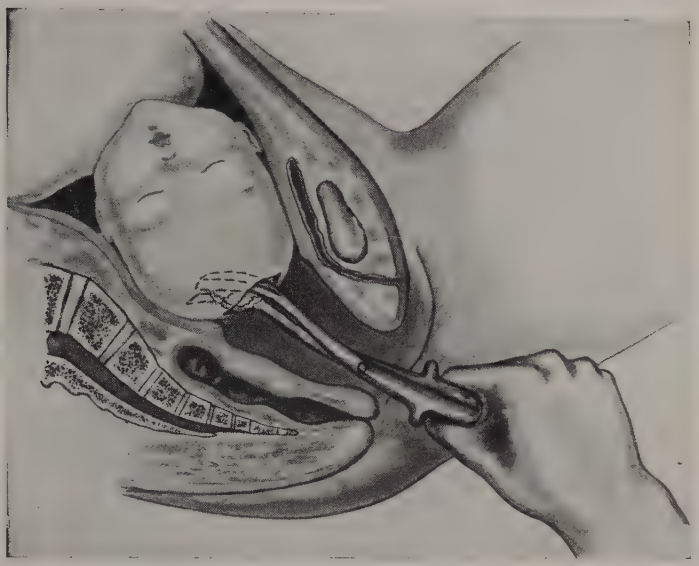


Fig. 6326.—A Less Desirable Manner of Using the Cranioclast – for wrenching away, piecemeal, the bones of the cranial vault.

fingers of the left hand, as the blades of obstetric forceps are guided. Finally, all three blades are firmly compressed and locked – the head being compressed with the turning of the screw. At other times it is easier to adjust only one of the outer blades to the central, or perforating blades – then crush this as-

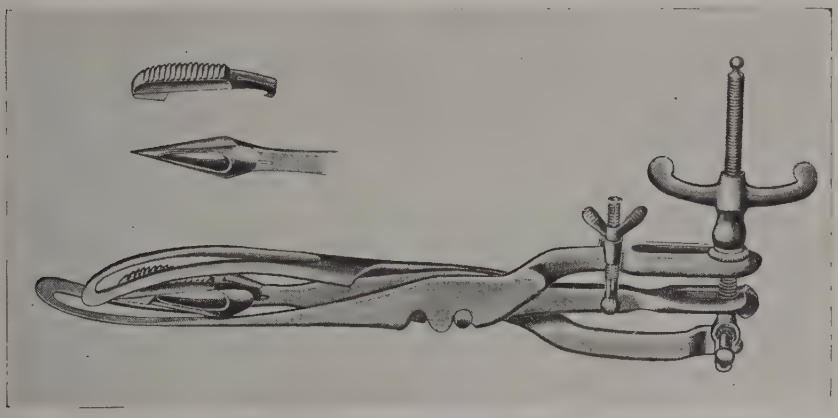


Fig. 6327.—Tarnier's Basiotribe.

pect of the head – and then adjust the opposite outer blade, and crush that aspect. In any event, the screw should not be turned home and the crushing done, whether with two or three blades, until one is convinced of the satis-

factory grasp of the instrument. When the crushing has been completed, the basiotribe, with its contents, is guided out of the parturient canal along the general lines of withdrawing forceps _ with added care, because of the deformities and contractions usually present, and because of the greater awkwardness of the somewhat bulky and straight instrument.

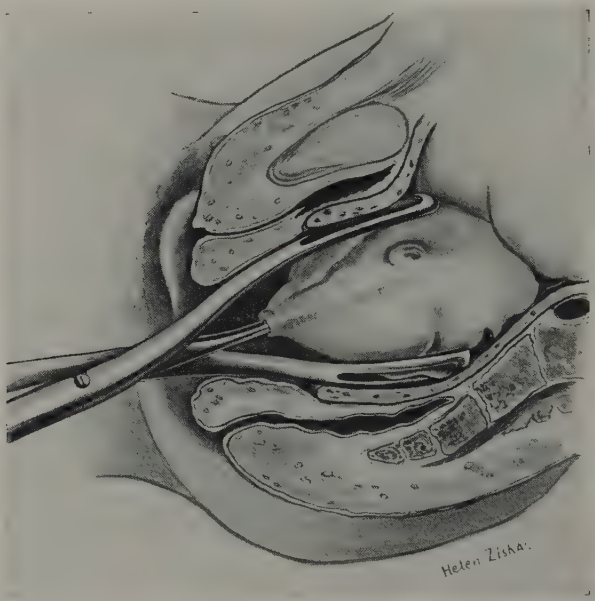


Fig. 6328.—Destroying Life and Crushing the Head, by Means of Auvard's Basiotribe, in Obstructed Head Presentation.

(*f*) **Decapitation.**—In this procedure, the head is severed from the trunk _ by means of some special form of sickle-knife, stout scissors, or pliable saw (even wire, or twine having been used) _ after which, the body is generally first removed _ and then the head. The operation has been most frequently performed for impacted transverse presentations _ in those cases in which it

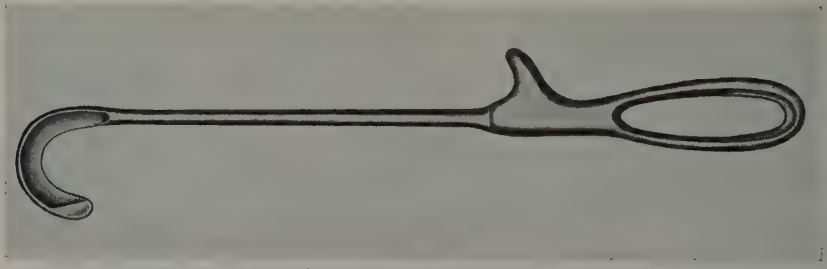


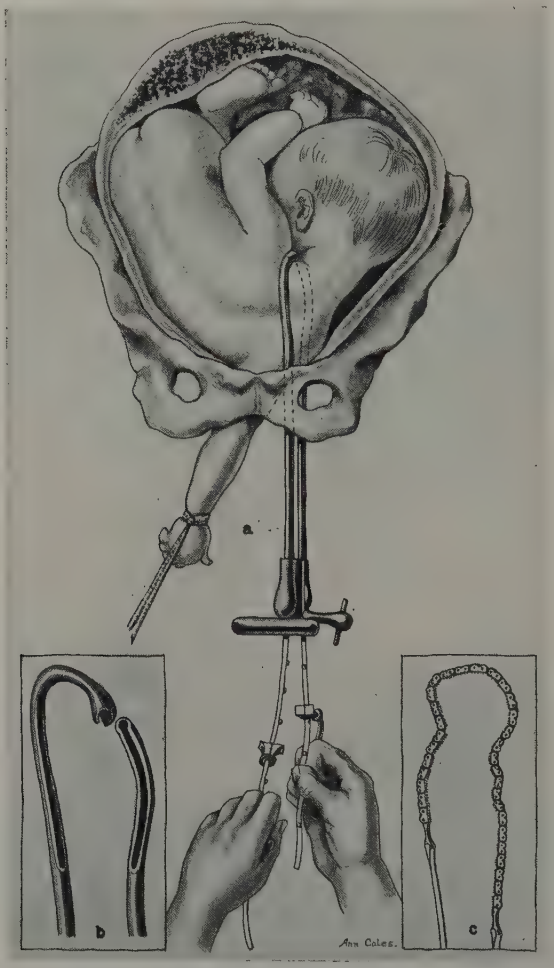
Fig. 6329.—Braun's Decapitating Sickle Knife.

has proved impossible to accomplish version. The exact position of the neck is determined by digital examination. In these cases the arm is often prolapsed, which serves as a special aid in decapitation (unless the arm and shoulder are large enough to block the way), enabling the parts to be drawn and held within better reach. The special instrument employed is guided to the neck by

Fig. 6330.—Decapitation, in Arm Presentation, by Means of a Sickle Knife—guarded by the fingers of the opposite hand, in introduction—and by the fingers and thumb in the subsequent act of severing the neck.

Fig. 6331.—Intra-uterine Decapitation with Scissors—the prolapsed arm interfering with delivery.

means of the fingers of the opposite hand _ which both guard it during its action, and also protect the adjacent soft parts of the mother. In using the sickle knife (Fig. 6329) it is usually more convenient to conduct it over the shoulder from behind, with the point of the sickle sinking into place from the front _ although it may be brought into contact from the opposite direction (Fig. 6330). The Operator's left thumb and fingers so complete the two-thirds circle



Figs. 6332–6334.—Intra-uterine Decapitation by Means of a Chain or Gigli Saw, Conducted by the Ribemont-Bong Protector _ the concave aspect of the shielding instrument (which protects the soft parts upon its convexity) is windowed opposite the neck: _ a, The technic; _ b, guard; _ c, Gigli saw.

of the sickle as to protect all tissues of mother and child except those being actually divided. The sickle is then drawn down over the neck _ and, by a cutting, to-and-fro, rocking movement, the neck is completely divided _ the knife edge finding its way between two of the vertebræ. The bladder and rectum are to be especially guarded.

In employing stout, blunt-pointed scissors (Fig. 6331), and this technic

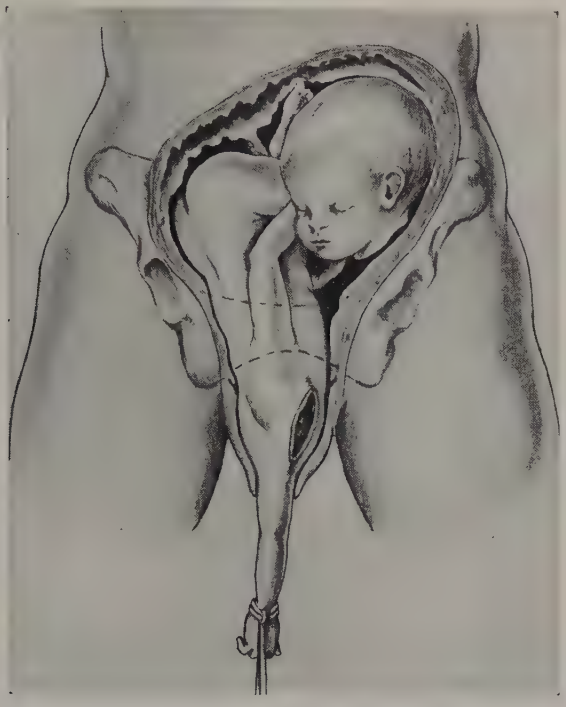


Fig. 6335.—Delivering the Body, After Intra-uterine Decapitation.

Fig. 6336.—Hand-extraction of a Severed Head.

is preferred to that with the sickle-knife by some – their ends are guided into position by the left fingers of the Operator, into contact with the neck – and

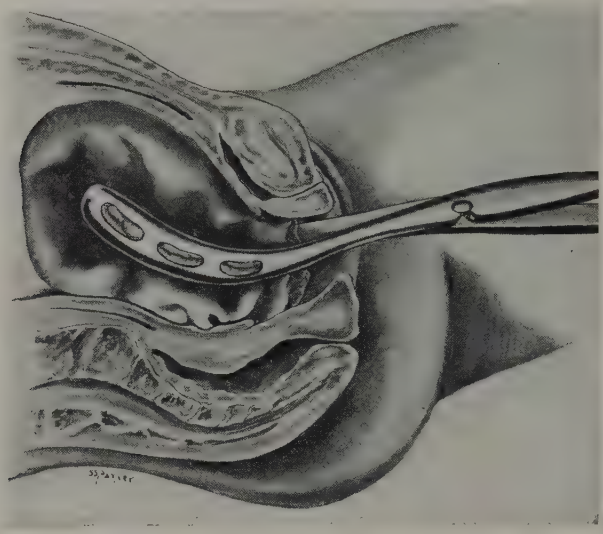


Fig. 6337.—Crushing and Extraction of a Decapitated Head, by Means of a Cranioclast.

no closure of the blades is made unless it be definitely known what structures will be cut – and, in approaching the distal aspect of the neck, a finger is car-

Fig. 6338.—Decapitation of a Partly Expelled Child, in Twins Interlocked by Their Heads – seen in partial section.

ried in advance of the closing blades so that they will not cut important structures beyond.

The division of the neck by special saw is seen in Figs. 6332–6334.

When the head has been clearly cut from the body, it is generally steadied above the symphysis, by pressure through the abdominal wall, while the trunk

Fig. 6339.—Levert's Blunt Hook.

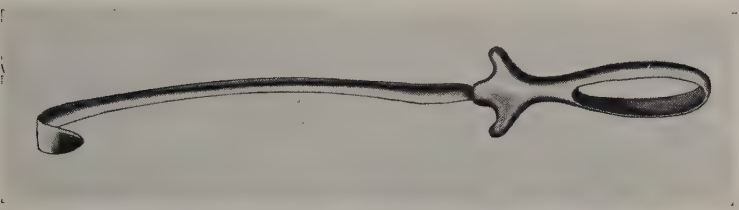


Fig. 6340.—Levert's Sharp Hook.

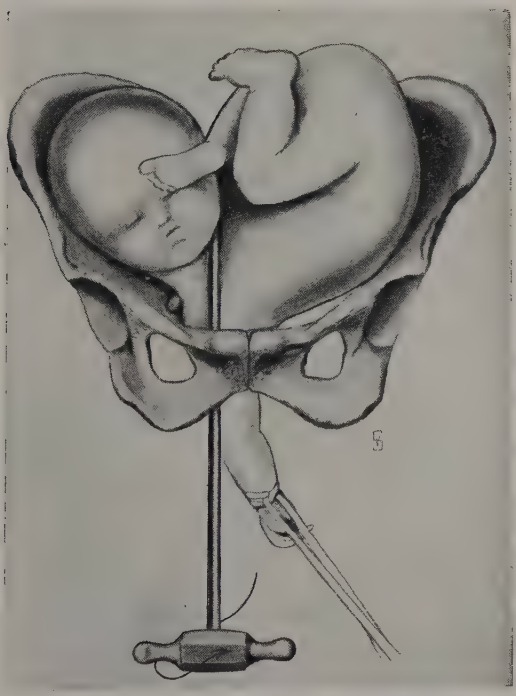


Fig. 6341.—Decapitating, or Breaking the Neck, with a Blunt Hook. In the present case the hook is twisted through a quarter, or half circle, in the direction indicated by the arrow. The prolapsed hand is used as a tractor, by means of a thong, or is grasped by gauze. The fingers of the opposite hand guide the hook and guard the maternal structures.

is delivered by the traction upon an arm (Fig. 6335). The head will then sometimes be born spontaneously, through uterine action. Its delivery, how-

ever, is usually required. This can sometimes be accomplished by carrying two fingers into the mouth (Fig. 6336), while the head is being depressed from without and hooked out – or a crotchet may be inserted into the mouth, or into an eye, and the head be thereby drawn out. Sometimes it may be necessary to first crush the head and then deliver it, by means of the cephalotribe (Fig. 6337).

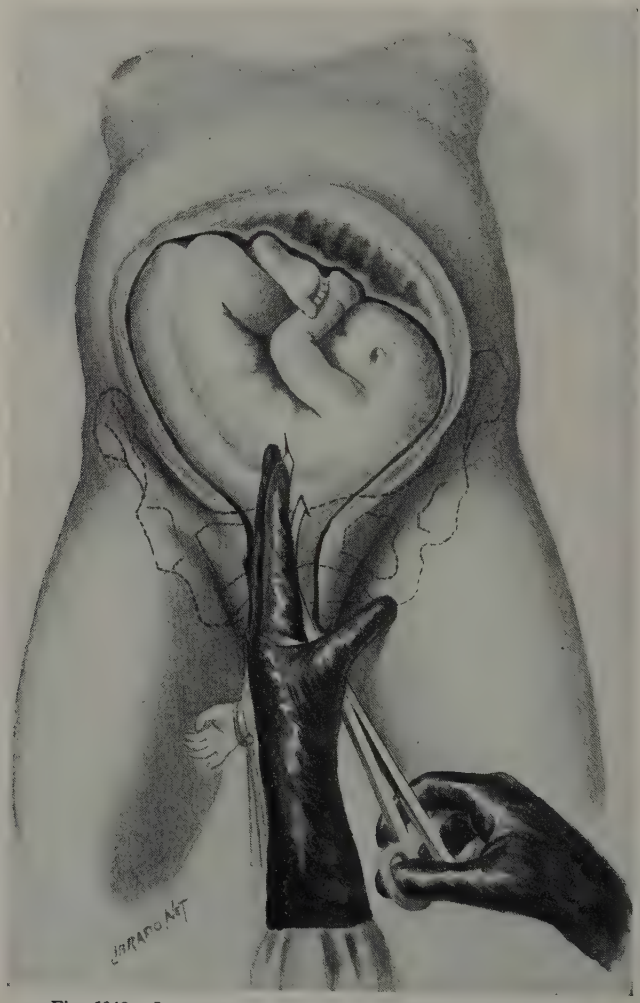


Fig. 6342.—Intra-uterine Section of the Spinal Column.

Decapitation may be required in the case of the interlocked heads of twins – where, for instance, the body of one is born, and their heads remained interlocked by their chins (Fig. 6338). The head of the child whose body is born is decapitated, by scissors or by sickle-knife – after which, the decapitated head is pushed up into the uterus, and the head of the living child brought down and delivered, usually with forceps. Finally, the decapitated head is delivered as described in the last paragraph.

Decapitation is sometimes performed in an exceedingly crude fashion –

too barbarous and unsurgical to be described in the many modern works in which it still finds exposition. Hooks, blunt and sharp (Figs. 6339 and 6340) are used. They are carried around the neck of the child within the uterus, as the sickle-knife is carried _ and are then wriggled and twisted, back and forth (Fig. 6341) _ until the backbone is broken _ and then further wriggled _ until surrounding soft parts are whipped into shreds, partly holding, partly broken _ after which the surrounding bag of skin is cut with scissors.

(*g*) **Transverse Division of the Spinal Column and Fetal Body, Followed by Manual or Instrumental Delivery.**—The necessity for this measure is most apt to occur in cases of impacted shoulder. The expressions, spondylotomy and rachidotomy, sometimes employed, do not at all fully cover the technic. The back of the child usually makes a convexity at the site of

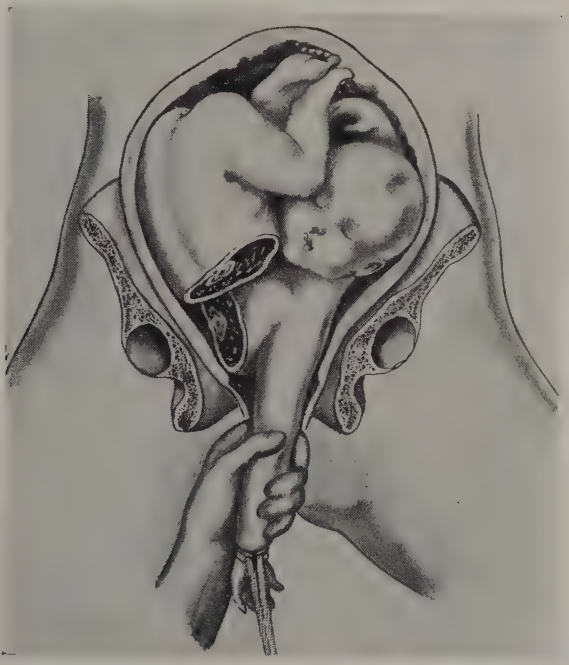


Fig. 6343.—Transverse Section of the Fetus Has Been Accomplished _ and the Upper Half is in the Act of Being Extracted, by Traction Upon the Arm.

presentation _ with the opposite shoulder and head up on one side, and the pelvis up on the other _ with, often, a prolapsed hand (which constitutes a useful tractor, in the manipulations). Guided by the left hand, very strong, heavy, curved, blunt-pointed scissors are guided to the spinal column (Fig. 6342) _ which is transversely divided, the scissors passing through an intervertebral cartilage, levering its way between the contiguous vertebral processes, or dividing them. While traction is being made upon the prolapsed arm _ or, in its absence, while the trunk is depressed by pressure through the abdominal wall, the entire thickness of the body, at the level of the transverse spinal section, is transversely cut through _ guarding, as well as possible, the parts beyond, as the distal portion of the section is made. When the division has been completed the upper end of the body is usually first delivered, by traction upon the arm (Fig. 6343), and then the lower part of the body, by

traction upon a leg (Fig. 6344). Occasionally the cephalotribe has to be applied, to accomplish delivery.

(*h*) **Destruction of the Fetus and Delivery, Following Abdominothoracic Evisceration.**—In this procedure, the viscera of the abdominal and thoracic cavities are evacuated _ through a transverse section carried through the most prominent part of the abdominal, or thoracic, or common abdominothoracic wall (Fig. 6345). The chief indication for the procedure, is in shoulder presentations with impaction _ especially where the head is placed so high that it cannot be reached for decapitation _ and also in some cases of large fetal tumors, and in monstrosities. Stout, curved scissors, guided by the left fingers, make the transverse section _ after which, evisceration of one, or of

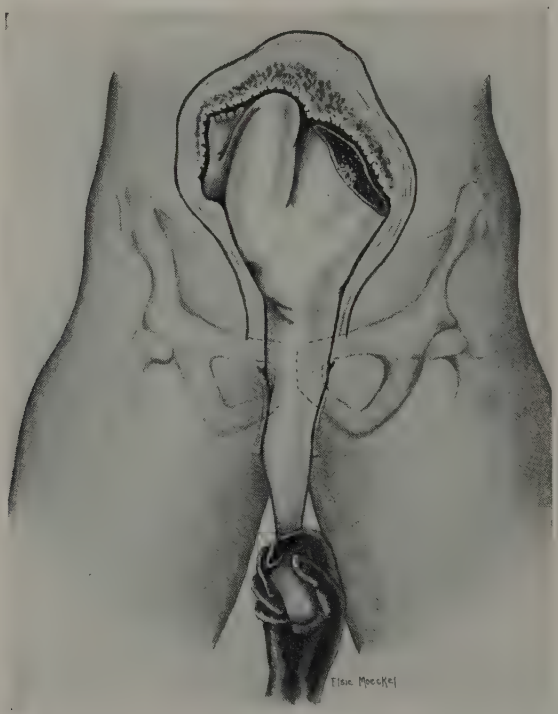


Fig. 6344.—Following Delivery of the Upper Half of the Body, After Transverse Division of the Fetus, the Lower Half of the Body is Delivered by Traction Upon a Leg.

both cavities is accomplished, by means of the fingers _ or by such an instrument as placental forceps (Fig. 6346).

(*i*) **Transverse Division of Both Clavicles, to Lessen the Shoulder Girdle of the Dead Fetus.**—This procedure, sometimes termed "cleidotomy," has been usefully performed in cases where it was indicated to lessen the biacromial diameter. It is best accomplished with stout scissors _ directed to the site of section by the fingers of the opposite hand (Fig. 6347). The clavicles are best divided as near the trunk as possible _ but may have to be cut wherever they can be reached. As a result of the division, the ends of the cut clavicles overlap _ thus narrowing the shoulders to that extent. The child is then delivered by traction upon the head. The head may have to be first removed, in order to reach the clavicles _ and the body be removed by a finger or crotchet in the axilla.

Fig. 6345.—Transverse Division of the Anterior Abdominal Wall, Preparatorily to Evisceration.

Fig. 6346.—Eviscerating the Abdominothoracic Cavities, by Hand, Through the Transversely Divided Abdominothoracic Wall.

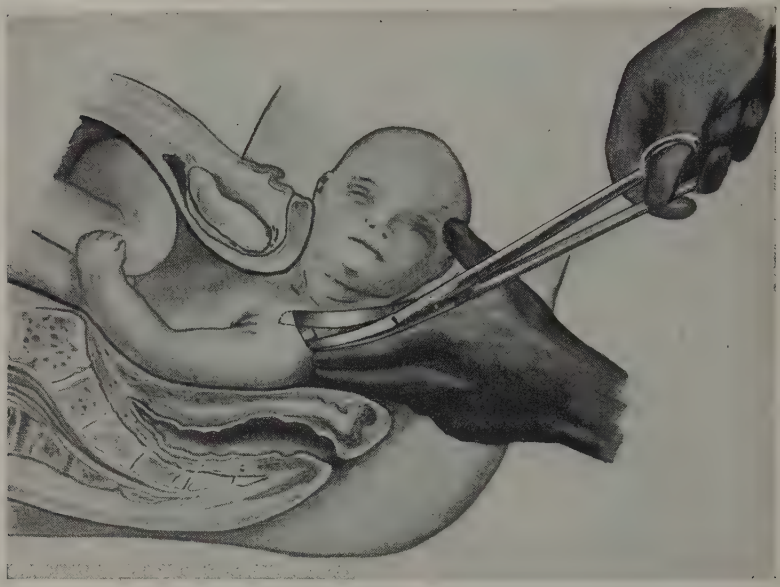


Fig. 6347.—Division of Both Clavicles, with Scissors (Double Cleidotomy) to lessen the biacromial diameter of a dead child, offering shoulder obstruction to delivery. (Modified from Edgar.)

CHAPTER XCIV

OPERATIONS UPON THE PUERPERAL UTERUS AND VAGINO-PERINEUM

Operations for the vulvo-vagino-perineal, and vagino-perineo-ano-rectal lacerations of labor, performed immediately or shortly after confinement, p. 875.

Operations for cervical lacerations of labor, performed immediately after confinement, p. 880.

Irrigation of the postpartum uterus, p. 882.

Digital examination and removal of retained contents of the postpartum uterus, p. 883; _ Curettage of the postpartum uterus, p. 884.

Surgical treatment of postpartum uterine hemorrhage, p. 884.

Removal of the uterus in the infections following labor, p. 891.

In this chapter will be considered the operations which are often called for, and performed, during the puerperal period _ the period following the delivery of the child and placenta, during which the patient is ordinarily confined to bed.

OPERATIONS FOR THE VULVO-VAGINO-PERINEAL, AND VAGINO-PERINEO-ANO-RECTAL LACERATIONS OF LABOR, PERFORMED IMMEDIATELY OR SHORTLY AFTER CONFINEMENT

These operations differ from the corresponding classical ones performed at more or less distant dates after convalescence _ in that those carried out immediately after labor, deal with freshly raw surfaces _ and those done within a few days of labor, with granulating surfaces. The principles involved in the two class of operations _ puerperal and postpeurperal _ are the same _ except that in the former no preliminary denudations of areas is required.

The standard operations for the repair of lacerations of the vagina, perineum, anal orifice, and rectum are described and pictured upon pp. 184–229.

Lacerations of the structures in and about the vaginoperineal outlet are usually the result, in obstetric cases, of one or more of three sets of conditions _ ordinary, normal distention of the parts during labor _ obstetric complications in non-instrumental delivery _ and to the use of forceps and other instruments.

Time of Operation.—These are: _ Immediate (or primary) _ performed immediately after labor has been completed; _ Intermediate _ usually performed within twenty-four to forty-eight hours after labor, or, at the latest, during granulation; _ Secondary (or remote) _ performed at any time subsequent to healing, and after the cicatricized and adjacent areas have been denuded.

The repair of the lacerations connected with delivery should be made as soon after delivery is completed as _ through the nature of the case, the patient's condition, and the available accessories and assistance _ this is possible. Immediate operation, following the delivery of the placenta and control of uterine bleeding, is the method of choice. A desperate condition of the patient, or some equally weighty consideration may warrant postponement until the following day _ at which time the lacerated parts are practically as favorable for primary union as at the time of completed delivery. The parts may unite if sutured at a later period, during granulation _ though the further this is deferred, the less are the chances for union.

Principle of Immediate Repair of Lacerations of the Child-birth Tract.—The accurate approximation of torn tissues to each other, by suture, so as to exactly reproduce their continuity _ is the underlying guide in this, as in all fresh wounds. In operating for fresh vaginoperineal lacerations, the actual guides to the steps are very much more in evidence than they are in secondary operations for these lacerations _ where not only the parts which are to be approximated have shrunken, and often drawn out of both reach and sight _ but, in addition, must be exposed by some method, often quite complex of denudation, before they are even brought into the field to be dealt with.

Grades of Laceration of the Vaginoperineal Tract.—These are sometimes grouped more or less arbitrarily as follows: Lacerations of the first Degree _ involving the vagina or perineum, or both, superficially; _ Lacera-

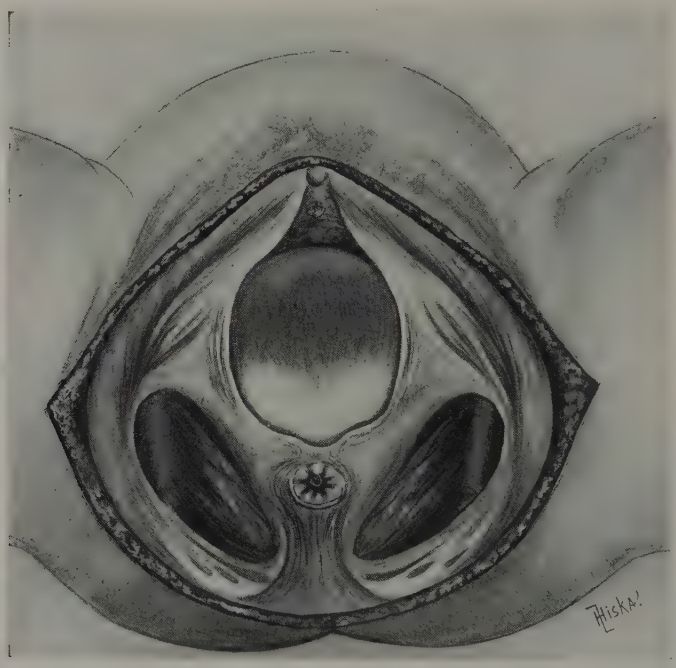


Fig. 6348.—Methods of Production of Vaginoperineal Lacerations, by the On-coming Head.

tions of the second degree _ A deeper grade of vaginal, or perineal, or perineovaginal tear, short of involving the rectum; _ Lacerations of the third degree _ tears which involve the vagina, perineum, anal orifice, and rectal wall.

Preparation for the Repair of Vaginoperineal Lacerations.—The parts involved have been and will continue to be more or less bathed with the uterovaginal discharges _ but, nevertheless, should be gotten as clean as possible _ by gauze sponging with some weak antiseptic solution, followed by normal saline solution _ just prior to repair. In the majority of opertions performed immediately after labor, no deadening agent is required _ the parts being already benumbed by the stretching to which they have been subjected. If further analgesia be required, novocain solution may be injected. Anesthesia is rarely required.

Repair of Superficial Vulvovaginal Laceration.—In many instances,

no surgical repair is required – or, even if required, possible – as, for instance, where a tissue-paper-like thinness of mucosa is, as it were, pushed, or rubbed away from a surface, by the long-acting push and friction of the on-coming head. The denuded surface heals by peripheral growth of epithelium, from the margins and from islands.

When, on the other hand, such tears are in the form of a distinct furrow, or gouge, rather than a surface-rub, then the margins of such wounds should be brought together by superficial sutures of fine catgut – as shown in Fig. 6349.

Repair of Intermediate Grades of Vulvo-vagino-perineal Lacerations.—These may be of the median type – or the bilateral limbs, in the vaginal

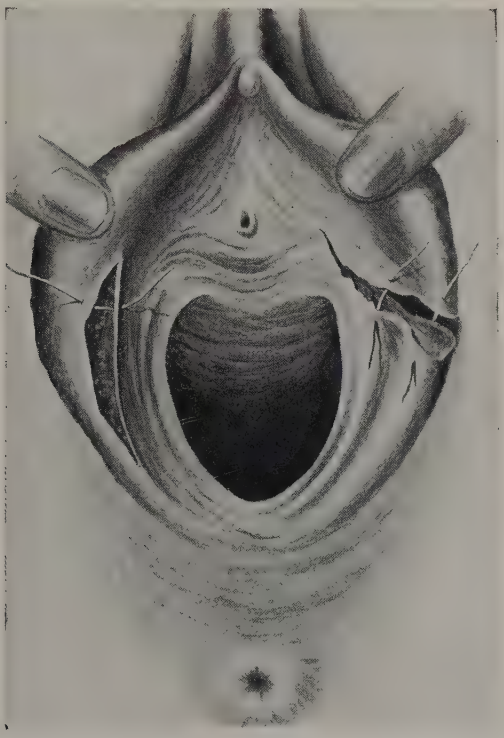


Fig. 6349.—The Repair of Superficial Vulval Lacerations.

sulci, may form, by their union in the midperineum, a Y-shaped or U-shaped form of tear – or tear may be entirely irregular in figure – and may be subcutaneous, involving only the tissues under skin and mucosa – or a single, or multiple tears may be present. While these tears often only involve the mucocutaneous and connective-tissue planes, they also frequently include the stronger, more important muscle planes of pelvic support – upon the substantial repair of which, so much depends. If the tear, though extensive, be superficial, only superficially placed marginal stitches are usually required (Fig. 6350, **e**). If it be deeper, so that the main perineal supports are involved, these deeper, more important parts should be first repaired by buried sutures of chromic catgut (v. Fig. 6350, **d, d**), and the margins of the superficial parts be brought together over these. Any portion of tissue encountered

during the process of repair, which seems badly traumatized and apt to die, should be trimmed away.

In concealed, or submucocutaneous rupture, the overlying mucosa and skin should be incised, thereby converting the laceration into an open one – after which, it should be repaired in the usual manner.

Repair of Complete Vagino-perineo-ano-rectal Lacerations.—In this type of tear, the pelvic muscle sling, sphincter ani, anal orifice, and rectal wall are all torn, in addition to the superficial vaginoperineal muco-cutaneo-cellular structures. In the process of surgical repair, each one of these structures is reunited by suture – from within, outward – beginning with the anal ring and the rectal wall.

The margins of the torn rectal wall are often, unwisely, brought together by sutures which penetrate their entire thickness and are then tied upon the in-

Fig. 6350.—Postpartum Vaginoperineorrhaphy; – Both lateral vaginal sulci and the perineum are involved in a Y-shaped tear. The deeper parts of the musculocellular pelvic sling are brought together by buried sutures of chromic catgut, b – and the margins of the wound, by superficial stitches, e; – d, combination superficial and deep sutures; – a, the contour of the rectum.

testinal aspect of the wound, beginning with the highest stitch (in the wrong manner, shown for illustration, in Fig. 6351). These chromic catgut stitches should be passed from the perineal aspect, including the thickness of the margins of the rectal tear exclusive of the mucosa (Fig. 6352). When these stitches are tied, the lumen of the bowel will be shut off from the wound – with no intervening capillary drain to serve as the route of infection. This row of rectal sutures, cut short, is buried by the following tiers of suturing.

The torn ends of the sphincter ani are next brought into the field – tending as they do, to pull away to each side. Their ends – squarely cut, if ragged – are then sutured together, either by simple or mattress-stitches – this tier of suturing reinforcing the tier of rectal stitches.

The two ends of the severed musculocellular pelvic sling are similarly united by buried chromic catgut stitches – and these will not be as difficult to bring into the field as they are in secondary operations, for they will not have permanently retracted. Their accurate and substantial union is especially important – furnishing, as they do, the main sustaining power of the pelvic floor.

In uniting the connective-tissue plane and mucocutaneous margins, if the tear have been median, this will be comparatively simple. But if the laceration be Y-shaped, then each lateral sulcus must be first sutured (v. Fig. 6350) – after which, the median limb of the Y is sutured.

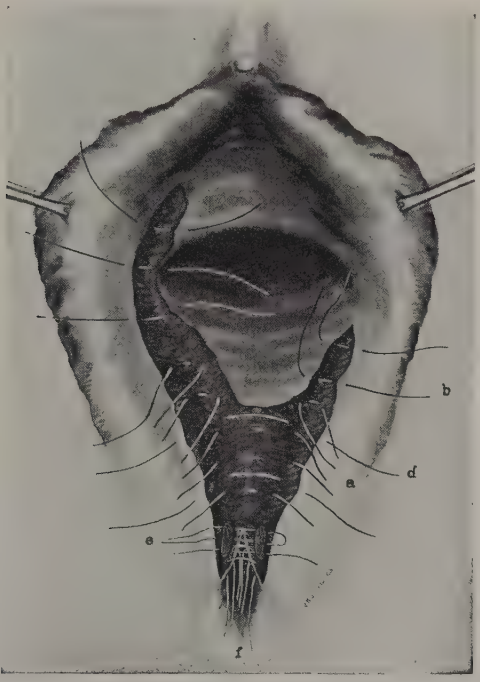


Fig. 6351.—Postpartum Repair of Vagino perineo-anorectal Laceration; – Both vaginal sulci, the median perineum, anal orifice, and rectum have been torne: – a, a, Deep, buried sutures of the musculocellular pelvic sling; – e, sutures of the ends of the broken sphincter, one mattress and one plain stitch; – b, superficial marginal sutures; – d, mixed deep and superficial sutures; – f, illustration of method in which the rectal sutures should not be applied – they should lie entirely within the wound, passing into, but not through, the wall of the rectum.

Comments.—There is a tendency, in repairing these lacerations, to place the sutures near the extreme margins of the tears – instead of placing them, approximately, 8 to 12 mm. ($\frac{1}{3}$–$\frac{1}{2}$ inch) from the margins.

There is also even a greater tendency to tie the stitches too tightly. The parts should simply be brought into comfortable contact – leaving some leeway for the inevitable swelling – which, if the parts be too tightly tied on the start, will often cause the stitch to cut through.

It is to be remembered that the tears in the sulci, with the rending apart of the levator ani, are much more important in destroying support, unless well repaired – than apparently a much more extensive simple perineal tear, technically sutured.

Examination should always be made for tears of the anterior vaginal wall.

Fig. 6352.—Postpartum Repair of a Complete Median Vagino-perineo-rectal Tear; – Repair of the rectal wall, by sutures which do not penetrate its mucosa; – repair of the severed sphincter; – repair of the musculocellular pelvic sling is not shown; – marginal sutures of the vaginal mucosa and perineal skin.

OPERATION FOR THE CERVICAL LACERATIONS OF LABOR, PERFORMED IMMEDIATELY AFTER CONFINEMENT

Laceration of the cervix uteri, in some degree, is almost an invariable occurrence in first labors – and very frequently occur in later labors – even though these may be normal. They are additionally present when complications are present – and when instruments are used.

These tears may be so insignificant as to be scarcely recognizable – or may extend so high up as to constitute, practically, an extraperitoneal rupture of the uterus. A submucous type of laceration may also occur – in which the cervix appears unusually patulous. In position, they may be unilateral (generally of the left side), bilateral, and, occasionally multiple – and, rarely, circular (the lower aspect of the cervix being sometimes torn from the uterus).

Exceptionally, hemorrhage in connection with laceration of the cervix may be considerable – coming from branches of the uterine arteries.

Formerly, cervical lacerations were never repaired immediately after their occurrence – but their repair became secondary operations. At the present time, however, unless there be good reason to the contrary, the repair of cervical laceration should immediately follow delivery – that is, should be primary. The great advantages of primary repair of lacerated cervices, are the following: – control of hemorrhage (when this is present from that source) – lessening of the chance of infection – aid to normal subinvolution – avoidance of those pathologic conditions due to, or increased by unrepaired laceration –

and the avoidance of the choice, or necessity of a formal secondary operation, and consequent sacrifice and confinement, when these could be covered during the necessary confinement of the puerperium.

Immediate Repair of Cervical Laceration.—No anesthesia, nor analgesia is usually necessary. The patient is generally put into the cross-bed position, in the dorsal decubitus. The vulval boundaries and vaginal walls are drawn backward and apart by retractors. Guided by a finger the vagina, opposite aspects (usually the anterior and posterior) of the cervical lips are seized by a non-traumatizing vulsellum forceps. By these means, the cervix

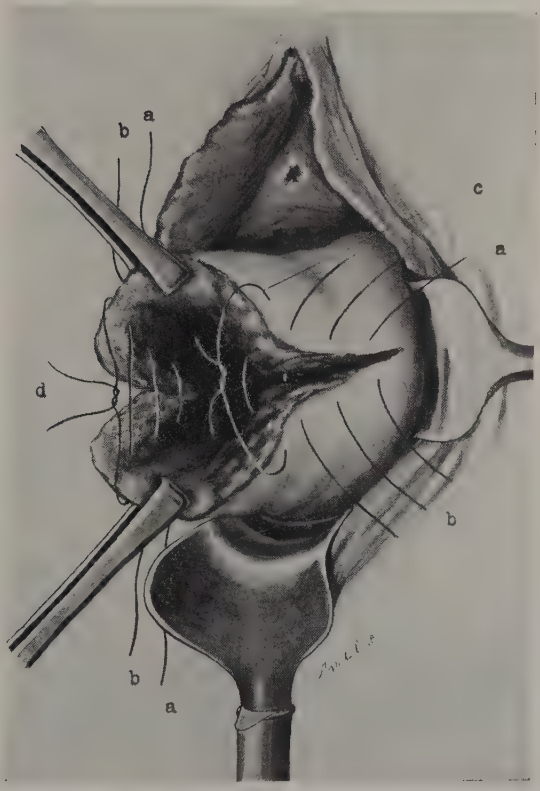


Fig. 6353.—Immediate Repair of Laceration of the Cervix Uteri, Following Labor; the vulvovaginal outlet has been drawn backward by retractors and the cervical lips drawn forward by vulsellum forceps: a, b, Sutures passing laterally through the entire thickness of the margins of the torn cervical wall; c, d, sutures passing through the junction of the lacerated with the free margins of the cervix.

is drawn forward and manipulated during the process of repair (Fig. 6353). A stout curved cervical needle, held in a holder, and armed with No. 2 chromic catgut, twenty day, is conveniently used in the technic. The interrupted sutures are carried through the entire thickness of the cervical lips, from without, inward and then from within, outward, through the opposite margins of the laceration of the one side after which, they are tied on the outside, cut short, and allowed to be absorbed which is a vast improvement upon cutting out the silver wires which were formerly employed. The highest suture is usually the most important, from the standpoint of controlling hemorrhage and is

generally the first one placed. Sometimes the lowest stitch is first placed – and then this one is used as a tractor, in aiding to expose the rest of the area to be sutured. All the sutures of one side are placed before any are tied – as a better view is thus secured for the passage of the needle.

If any detectable bleeders are present, these are seized with fine hemostats and tied with fine catgut.

One must be careful not to encroach so much upon the cervical canal, in the process of suturing, as to block this as a drain of the uterine discharges during the puerperal period.

Repair upon the delivery table is more technical than when performed upon the side of a bed.

After the uterus has been thus forcibly drawn down for the placing of the sutures, it is carefully replaced, manually – so as not to leave the heavy organ out of position, at the end of the operation.

The secondary operation for cervical laceration, exhibiting some features in common, is described and pictured on pp. 263–270.

IRRIGATION OF THE POSTPARTUM UTERUS

Irrigation of the puerperal uterus is usually called for in postpartum sepsis arising from infection incurred through the uterine surfaces – for the purpose

Fig. 6354.—Postpartum, Intra-uterine Irrigation – with a Bozeman-Fritsch uterine irrigator The uterus is being simultaneously gently kneaded during irrigation – which will also tend to remove all fluid and débris in its cavity.

in simple intra-uterine douching, of washing away fluids and solid detritus, such as portions of retained but largely or entirely detached membranes and placenta – and, if some bactericidal agent be added to the douche (such as bichlorid of mercury, and the like), of disinfecting the uterine cavity.

Intra-uterine douching may also be performed for the purpose of flushing away the detritus loosened up by an immediately preceding curettage of the septic uterine cavity or of portions of retained but undecomposed structures – then constituting the final step of that technical procedure.

The simple act of irrigation, for uterine sepsis, should be performed early in its manifestation – when the causative bacteria are chiefly, or entirely, within the fluids bathing the mucosal wall, and in blood-clots, and pieces of partially or entirely separated decidua and placenta – and is correspondingly inefficient in proportion as the deeper uterine walls are infected.

The vagina should invariably be first douched and the vulval parts cleansed, before passing the irrigation tube – that additional infection may not be carried into the uterine cavity. The douche is usually delivered with the uterus in position – and without drawing it down into the vaginal outlet. The os externum may be first exposed by a bivalve speculum – which will aid in the carrying out of technical details preventive of carrying additional infection into the uterus. On the other hand, the vulval opening may be held apart by the fingers of the left gloved hand, while those of the right hand carry the tube through the vagina and into the uterus. The action of the entering and emerging flows from the two-way irrigator, is seen in Fig. 6354.

Fuller details of the technic of intra-uterine irrigation as used in general has been given in p. 246.

DIGITAL EXAMINATION AND REMOVAL OF RETAINED CONTENTS OF THE POSTPARTUM UTERUS

The digital examination of the non-pregnant uterus has been described on p. 252.

The digital examination of the puerperal uterus is, mechanically, an easier procedure – because of the more dilated state of the cervical canal and uterine cavity.

The indication for this examination, in the puerperal period, is usually for the purpose of detecting the cause of puerperal sepsis and, sometimes, puerperal sapremia – and, if a cause be detected which is digitally removable, to remove it. Decaying and infected decidual and placental products, and blood-clots – and such débris as these represent. The use of such mechanical damage to the uterine wall with the finger-nails as would be equivalent to using sharp curet in sepsis of uterine origin, with the breaking down of protective barriers and opening up uterine sinuses, would be open to the same comment as already made with reference to curetting the septic uterus (v. p. 884) – and would have to be decided in accordance with the individual Surgeon's views.

The digital examination alone – even if no instrumental use be made of the hand – is profitably made in advance of the ordinary curetment of the puerperal uterus – as it enables the curetment to be much more intelligently made, than if done in the dark without any exact idea as to what to is be accomplished by the curetment – or where the objects lie which are to be curetted away.

The patient is placed in the dorsal decubitus. Anesthesia is not necessary if the cervico-uterine canal be very patulous, and only an examination is to be made – but necessary if the canal be as closed as it is in the latter part of the puerperium or, whether closed or opened, if digital curetment is to be employed. The parts are thoroughly disinfected. The hand is gloved – and all of the fingers, except the thumb, are carried into the vagina – after which, the index, and then the next finger are gradually worked into the uterine cavity. While the fingers are being introduced into the cervical canal, the fundus of the uterus is steadied, through the abdominal wall, by the opposite hand – and as the fingers enter the cavity, the body of the uterus is depressed by the outside hand or by an Assistant – so that the examining fingers are able to reach the dome of the fundus. Besides accomplishing the examination, whatever is detachable and removable by the fingers, is removed and passed on downward and out of the uterus, between them. A flushing curet may some-

times be carried on up between the fingers _ and be used conjointly with them _ both for judicious curetment and for flushing.

CURETAGE OF THE POSTPARTUM UTERUS

The chief indication for cureting the puerperal uterus is for the purpose of removing the sapremic or putrefactive remains of placenta decidua and blood-clots _ that is, for sapremia.

The indiscrimate use of curretage of the uterine cavity in puerperal septicemia (bacteremia) _ as was formerly so commonly in vogue _ is, however, quite another matter. The large majority of cases of streptococcal infection recover _ and, in the advanced cases of uterine septicemia, the bacteria have generally gotten so deeply into the uterine wall, that they are beyond the reach of the curet. And what is of especially practical importance, curetage undoubtedly often breaks down the protective wall of leukocytes by opening up vascular and lymphatic channels, and breaking down protectively thrombosed veins, thereby widely diffusing what has been, until then, a relatively limited involvement, with an effort, on the part of nature, to wall it off by an actively antagonizing barrier.

Some Surgeons come out flat-footedly and oppose the curetage of the uterine endometrium in all cases of streptococci infection _ as being only apt to destroy what nature is trying to accomplish, and make bad matters worse, by opening avenues for the diffusion of the process. Others make use of it only limitedly _ and especially only in the initial stage of involvements. A few make use of the method when other efforts seem useless, or, when tried, fail.

Curetage of the postpartum uterus for the removal of sapremic products, is carried out in the same manner as has already been described for the conduction of curetage in general (v. p. 240). In postpartum cases, however, the uterine canal is usually so patulous that no preliminary dilation is required _ unless the procedure is carried out a considerable time after delivery, when the cervical canal has largely contracted.

Curetage of the post-partum uterus for septicemic involvement _ when this is performed _ is not a small procedure _ for the reason that to be hopeful of accomplishing distinct results, the procedure must be very radical. Anesthesia is required. A large sharp curet is used _ and the uterine cavity is thoroughly and rather deeply cureted _ radical Operators even including the placental site (which most Surgeons avoid). This type of cureting is not, or should not be carried out until the uterine cavity is examined digitally, as far as this may be possible. Unless the curet is very sharp, the endometrium cannot be satisfactorily cut away. The uterine cavity is then thoroughly swabbed with the tincture of iodin, or other agent _ and packed with gauze for twenty-four hours. Extreme reaction often follows this rather heroic measure _ and, sometimes, death.

SURGICAL TREATMENT OF POSTPARTUM UTERINE HEMORRHAGE

The usual type of postpartum hemorrhage _ namely, that due to other than surgical traumatism, and after the placenta is entirely removed _ occurs from the placental site _ and is due to non-complete and non-sustained uterine contraction following labor (usually from uterine inertia or exhaustion). In primary postpartum hemorrhage, the bleeding occurs immediately after labor _ and, in secondary postpartum hemorrhage, at any time during the puerperium.

A number of methods are in use to control such hemorrhage _ the chief of which will be here described _ it being understood that the bleeding is occur-

ring only from the placental site, and not from traumatized parts – that the uterus is in position (not inverted), and that the entire placenta has come away, or been removed, and that no part of it remains – and that transabdominal grasping and massaging of the uterus has been practised to promote normal uterine retraction and contraction, and that ergotin has been employed hypodermically.

Introduction of the Hand Into the Uterus, for the Combined Purpose of Removing Possibly Retained Portions of Placenta or Decidua and Blood-clots, and to Promote Uterine Contraction.—The mere introduction of the hand into the uterus usually stimulates the uterus to retraction and contraction. A special feature and advantage of hand introduction, as at least

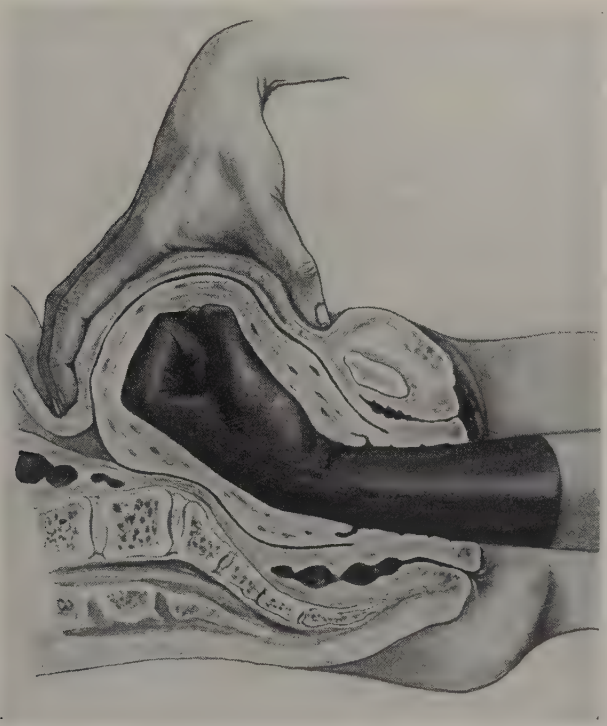


Fig. 6355.—Bimanual Compression of the Uterus, for the Control of Postpartum Hemorrhage – after the entire removal of the uterine contents.

a preliminary, independently of its being sufficient, alone, to lead to the permanent arrest of hemorrhage, over the blind packing in of gauze – is that it enables one to learn if the bleeding is caused by the retention of a portion of the placenta, or decidual membranes or blood-clots – and, if so, to remove these, so that the uterus can tightly contract. If the fingers alone then are unable to remove adherent structures, a uterine curet, or uterine (placental) forceps may be introduced alongside of the hand to aid in accomplishing the removal. If there be no unexpelled structure within the cavity – or, if one has been found, and removed – the uterus will usually be stimulated by the mere presence of the hand, to contract around it – thereby blocking the mouths of open vessels and sinuses against the hand – and it may be further stimulated to do so by compression of the uterine walls around the fist of the intra-uterine

hand by compression of the abdominal wall down against the outer uterine wall – bimanual uterine compression (Fig. 6355).

Instrumental Packing of the Utero-cervico-vaginal Tract, to Control Postpartum Hemorrhage.—Gauze packing of the cavity of the uterus, canal of the cervix, and vaginal cavity – by wide strips of gauze firmly placed, in superimposed layers, or masses, conveyed into position by uterine dressing-forceps – is the method of control most frequently employed – as well as the most efficient method – accomplishing its end largely by mechanical means, though in part, causing the uterus to contract about it.

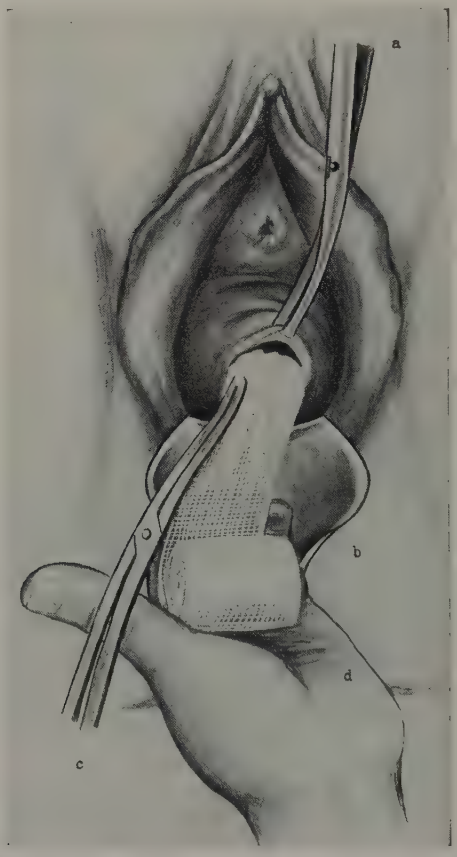


Fig. 6356.—Instrumental Gauze Packing of the Postpartum Uterus: – a, Vulsellum holding uterus forward, by grasping the upper cervical lip; – b, self-sustaining posterior vaginal speculum; – d, palm of hand (which should be gloved) supporting the gauze roll; – c, dressing forceps, feeding the continuous strip of gauze into the uterine cavity, from the fundus, downward.

A convenient form in which to have sterile gauze in readiness for intra-uterine packing, is purchasable in special glass tubes – the strips of gauze being 914 cm. (10 yards) in length – and 10 cm. (4 inches) in width, originally – this width being reduced to 1.6 cm. ($1\frac{1}{4}$ inch) by the folding in and stitching of the margins, to prevent the escape of ravellings. Or the gauze may be prepared in rolls. When rolled gauze is employed, the palm of the gloved hand is used as a receptacle for it – from which it is fed into the uterus with long, curved dressing forceps – which carry it, layer by layer, up to the fundus

of the uterus – packing the uterus snugly and rather tightly – but evenly – from the fundus downward, through the cervical canal – and ending by a firm packing of the entire vagina, as a supporting base for the uterocervical packing. This is conveniently carried out with the patient in the usual gynecologic posture – after vaginal retractors are inserted, and the upper lip of the uterus seized with a vulsellum, to bring the organ within reach. The vaginal tract must be prepared by antiseptic douchings, and the vulva similarly cleansed – so that the gauze may enter the uterine cavity without having been soiled on its way thither. This technic is shown, in full view, in Fig. 6356 – and, in sectional view, in Fig. 6357. It is much better that the gauze be conveyed as near to the cervical canal as possible, by being held in rather close contact with it by means of the tube – the cervix, the meantime, being

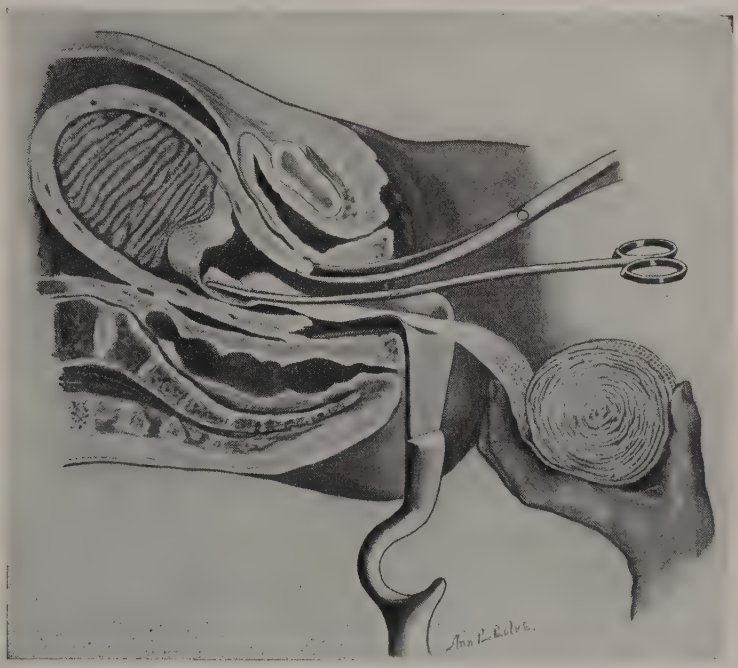


Fig. 6357.—Instrumental Gauze Packing of the Postpartum Uterus – seen in section.

drawn far enough forward to help span the distance, thus lessening the danger of fouling the gauze – which is of practical importance.

Digital Packing of the Utero-cervico-vaginal Cavity, to Control Postpartum Hemorrhage.—Digital packing of strips of gauze into the uterine cavity has one advantage over the preceding method – and one disadvantage. It enables the cavity to be more evenly and snugly packed – but it exposes the gauze to greater contact with the extra-uterine passages during the packing. The fingers of the hand are carried into the vagina, and onward into the uterus – which, at the same time, is depressed, through the abdominal wall, down upon the intravaginal hand. While the parts are in this position, the strip of gauze is fed, from its special receptacle, into the palm of the hand, by means of long, curved uterine dressing forceps – and, is then further packed by the intra-uterine fingers into close apposition with the walls of the cavity, from the very fundus, downward (Fig. 6358). When the entire uterine cavity

has been packed, the cervical canal is also snugly filled – and, last of all, the vagina itself. The final steps of the procedure are seen in Fig. 6359 (where, less desirably, small nuggets of gauze, rather than layers of gauze, are being packed into the cavities).

Gauze packing, thus employed, controls bleeding, prevents the formation of intra-uterine clots, and serves as a drain.

The packing, as well as all local methods used to control uterine bleeding, is aided, materially, by the hypodermic use of pituitary gland – of strychnin sulphate, gr. $\frac{1}{15}$, and aseptic ergot, 60 minims, or its equivalent – or by the application of large pieces of ice to the abdominal wall, over the uterus.

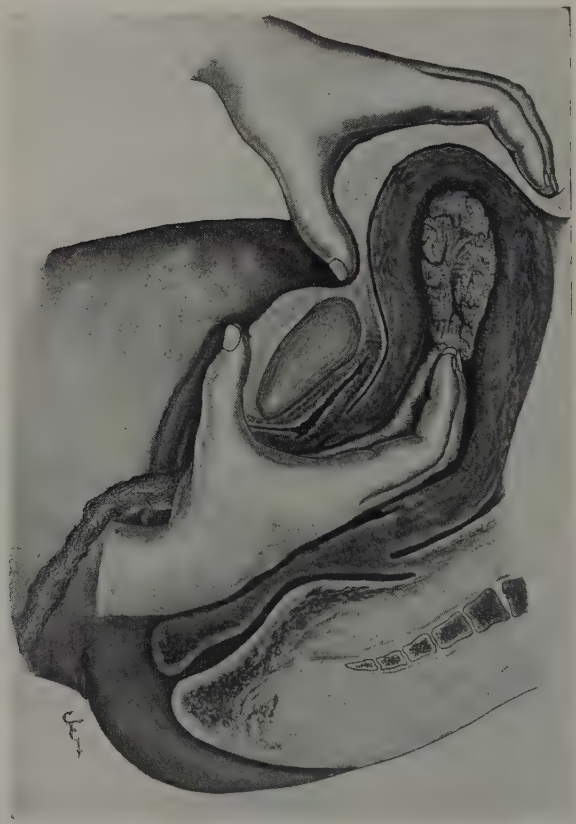


Fig. 6358.—Digital Packing of the Utero-cervico-vaginal Tract with a Gauze Strip; – the initial step – packing the fundus from within, while compressing it from without.

Bimanual Compression of the Uterus, for the Control of Postpartum Hemorrhage.—One method of applying bimanual compression of the uterus, for the purpose of controlling postpartum hemorrhage, is mentioned and pictured on pp. 885, 886 – where it is described as the final step, after having first introduced the hand for intra-uterine examination – and then using the intra-uterine fist around which to compress the uterus through the abdominal wall.

In addition to this method of procedure, another method of bimanual compression, probably not quite as efficient, is practised as follows: – One hand is introduced into the vagina and seizes the cervix – and the opposite

hand grasps the fundus uteri, through the abdominal wall, and bends the body of the uterus forward – thus lessening the cavity of the uterus and compressing its walls into contact with each other (Fig. 6360).

A still different method of bimanual compression, is to insert one hand, palm upward, into the vagina, the fingers here passing into the anterior vaginal fornix – while the opposite hand bends the body of the uterus forward – thereby compressing the uterus between the vaginal hand, extra-abdominal hand, and the resistant symphysis pubis.

Hot and Cold Applications for the Control of Postpartum Hemorrhage.—Sterile, hot water, at a temperature of about 118° F., delivered into

Fig. 6359.—Digital Packing of the Postpartum Uterus with Gauze Strip – completing the packing of the cervicovaginal portion of the tract – the gauze being here shown in the form of nuggets – fed into the uterus by dressing forceps.

the bleeding, postpartum uterus through a return-flow uterine irrigator, is often very efficient in controlling hemorrhage.

Large pieces of ice, carried by hand boldly into the uterine cavity, with other pieces applied over the uterus, outside, are especially effective – even if not as technical, from the standpoint of absolute asepsis – (although probably relatively free of organisms) – and, for that reason, open to criticism. The Author has used it upon innumberable occasions of uterine floodings – with invariably immediately successful result. An amusing instance once occurred to him in this connection, – Upon being examined in Obstetrics, in a foreign country, the Examiner asked, "What are the things you would do, in the emer-

gency of postpartum hemorrhage?" – and when the reply was made, "Introduce ice into the uterus," he thrust his hands into his pockets and, leaning back, laughing, said, "Where in the world would you get ice in an *emergency*?" – and then, for the first time, the fact dawned, that the Examiner lived in a country where, wisely, ice was almost unattainable – instead of being in every household!

Compression of the Abdominal Aorta, for the Control of Postpartum Hemorrhage.—This has been practised in several ways: – One, standing over the patient, may press his closed fist down over the abdominal aorta – with his arm fully outstretched (for he will soon fag, if the elbow be bent).

Momburg's method of controlling the abdominal aorta, once used to some extent, was to place the patient in the Trendelenburg position – bandage the

Fig. 6360.—Bimanual Compression of the Uterus, for the Control of Postpartum Hemorrhage – by angulation.

lower limbs up to the hips, and the upper limbs to the shoulders – and then apply a rubber tourniquet around the waist, between the costal arch and the umbilicus, until the circulation through the abdominal aorta was controlled. The method is dangerous in cases of cardiac and vascular degeneration – and, in any event, the constriction must be gradually relaxed, until the normal blood-pressure is restored. Bandaging of the limbs would also be contraindicated provided the method were resorted to before any appreciable amount of blood had been lost.

The abdominal aorta is said to be more safely compressed, as to collateral damage, by the Gauss abdominal compressor.

The simultaneous employment of intravenous saline infusion, must often be carried on in conjunction with the special measure being employed in the various methods of control of postpartum hemorrhage.

REMOVAL OF THE UTERUS, IN THE INFECTIONS FOLLOWING LABOR

Types of Puerperal Infection.—These are grouped, by Bumm, as follows:

(*a*) **Puerperal Wound Intoxication.**—Due to saprophytes – sapremia.

(*b*) **Puerperal Wound Infection.**—Due to bacteria – bacteremia, or septicemia – and which is accompanied by one, or two groups of phenomena,

(1) Localized Infection – which may manifest itself in the perineum, in the vagina, in the cervix, in the endometrium, and in the tubes.

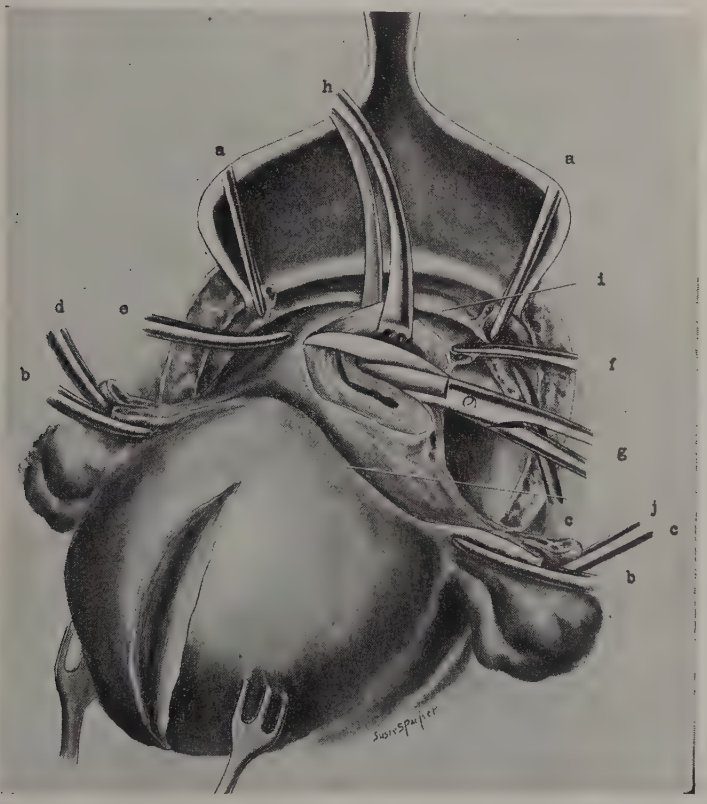


Fig. 6361.– Supravaginal Postpartum Hysterectomy; – The supravaginal division is here being made by stout scissors – after the broad ligaments have been divided on both sides, from above downward, between controlling clamps: – **a, a,** Clamps of round ligaments; – **b, b,** clamps of the broad ligaments; – **c, d,** clamps of ovarian vessels; – **e, f,** clamps of uterine vessels; – **g,** scissors, dividing neck of uterus; – **h,** vulsellum, grasping cervical aspect of the divided uterus. (The uterus is here shown incised, as though a cesarean section had been performed.)

(2) Diffused Infection – which may spread from one of the localized sites above mentioned, by one of two general routes – either

(*a*) Distributed by the blood-vessel route – ending in thrombophlebitis, pyemia, or septicemia – or

(*b*) Distributed by the lymphatic vessel route – ending in dissecting metritis, in parametritis, perimetritis, or peritonitis.

Total Hysterectomy in General Puerperal Septicemia.—In exceptional instances, the removal of the septic uterus may be indicated. In the majority of instances, the weight of surgical judgment is against the practice. The

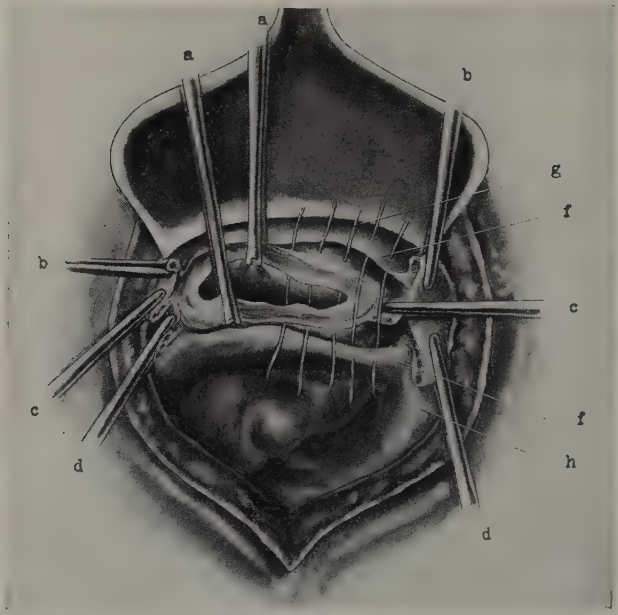


Fig. 6362.—The Same – II; – Closing the cervical canal: – **a, a,** Clamps of opposite aspects of the divided cervical canal; – **b, b,** clamps of round ligaments; – **c, c,** clamps of uterine vessels; – **d, d,** clamps of ovarian vessels; – **f, f,** cut margins of uterovesical and uterorectal peritoneal reflections; – **g,** through-and-through sutures approximating opposite cut margins of cervical canal; – **h,** overlying sutures of peritoneal margins.

Fig. 6363.—The Same – III; – Closure of the pelvic wound. The deeper tier of sutures close the cervical opening, by approximating its margins. The superficial sutures are bringing the margins of the vesical and rectal peritoneal reflections together, over the buried layer of suturing. The ligated uterine and ovarian vessels are seen – and the ligated stump of the round ligament.

reason of this latter stand is threefold: – about 20 per cent. of even the worst cases of puerperal septicemia and about 50 per cent. in average cases, recover spontaneously, – about 75 per cent. of the cases of puerperal septicemia which are operated upon by hysterectomy die, – and it is of very little avail to operate after the septic process has spread beyond the uterus, and there is no way of accurately knowing whether or not this has occurred, beyond repair. It is in the worst cases that operation is chiefly called for – and it is just in this type of cases that extra-uterine infection has usually occurred, beyond removable reach. These secondary involvements are generally the ones causing

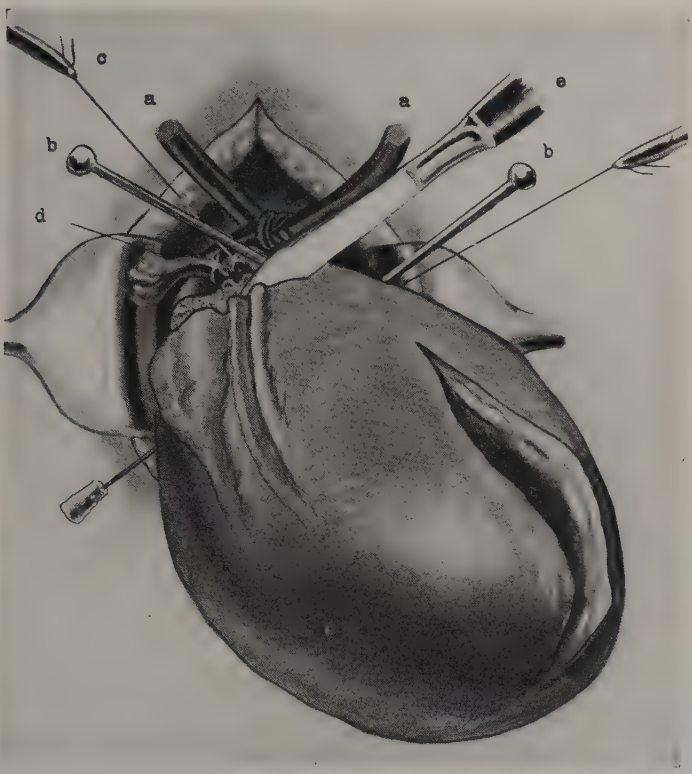


Fig. 6364.—Supravaginal Hysterectomy, with Exteriorization of the Cervical Stump, in Connection with Puerperal Sepsis, or as a Sequence Following Cesarean Section – I; – The enlarged uterus is shown, incised, in this instance, as for the performance of Cesarean section: – b, b, Steel pins, passed through the cervicocorporeal junction – below which, a stout rubber cord-tourniquet is tied, for temporary control of hemorrhage. The uterine, c, and ovarian vessels, d, are tied. A knife, e, is severing the body of the uterus from the neck. (Figs. 6364 and 6365 modified from Couvelaire.)

the most pronounced clinical symptoms – and are more apt to be made worse rather than better by hysterectomy.

A strong tendency of the times in dealing with puerperal septicemia, is gleaned from trends in the following directions: – scrupulous care in not producing infection during labor – avoiding, as much as it is possible to avoid, all handling and instrumentation, even douching, within the birth-tract, both during labor and during the puerperium – avoidance of curetement – the use, if irrigation is to be used at all, of simple normal saline, or, at most, of 50 per cent. alcohol, in the septic uterus (realizing that bichlorid of mercury, carbolic

acid, and the like, act very superficially) – and the employment of serum and vaccine therapy.

Unquestionably some cases occur in which total hysterectomy, by the abdominal route is indicated – but such decision must rest upon the judgment of the Surgeon, and that reached after very mature deliberation.

If hysterectomy be decided upon, the total removal of the uterus, not its supravaginal removal, is usually indicated.

The technic of total abdominal hysterectomy, by different methods, is fully described and pictured on pp. 633–697.

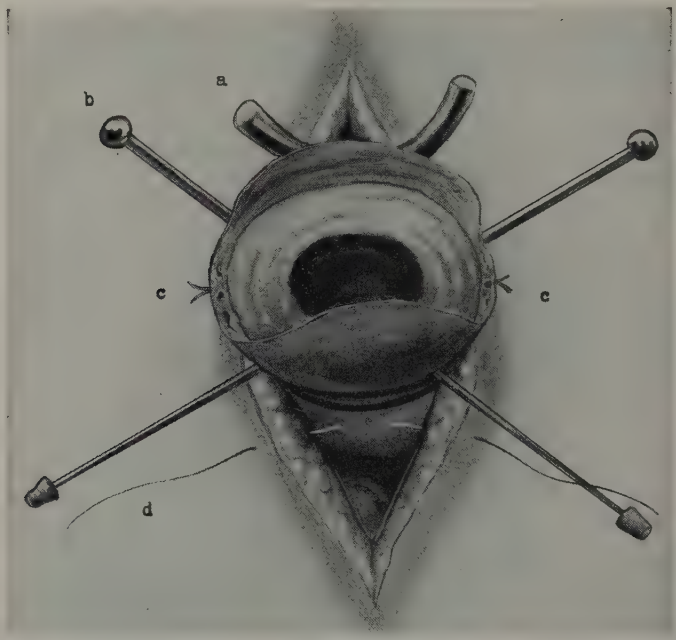


Fig. 6365.—The Same – II; – The cervical stump is being here anchored in the median abdominal wound. The steel pins and rubber tourniquet are still in position. The rubber cord will be removed – and the pins will be temporarily left in *situ*. The free margins of peritoneum, seen as anterior and posterior flaps, will be sutured over the raw cervical stump: – **c, c,** Ligatures of the ovarian vessels; – **d,** one of the sutures anchoring the cervical stump in the abdominal wound. The tissues of the lateral margins of the abdominal wound will be closely sutured around the protruding uterine stump – completely closing off the peritoneal cavity, and approximating the borders of the abdominal wound.

Supravaginal hysterectomy by the ordinary method is pictured in Figs. 6361–6363, and sufficiently described in the underlying legends (in conjunction with what has already been said of the methods of performing general, non-puerperal hysterectomy, referred to above).

Supravaginal hysterectomy, with exteriorization of the stump, is illustrated in Figs. 6364 and 6365.

CHAPTER XCV

OPERATIONS FOR ECTOPIC PREGNANCY

Operations for ectopic pregnancy, in general, p. 895.
Operation for ectopic pregnancy, p. 900.
Operation for early ectopic pregnancy, prior to abortion, or rupture, p. 901.
Operation for ectopic pregnancy, after rupture, or abortion, p. 902.
Abdominal operation in advanced ectopic pregnancy, with a dead child, p. 904
Abdominal operation in ectopic pregnancy, at the full term of a living child, p. 905
Operation by the vaginal route, in ectopic pregnancy, p. 905.
Report of an operated case of tubal pregnancy, on both sides, at different dates, p. 906

OPERATIONS FOR ECTOPIC PREGNANCY, IN GENERAL

Description.—Ectopic pregnancy _ or Ectopic Gestation _ is pregnancy which takes place "out of the normal place" _ anywhere out of the normal place.

Extra-uterine pregnancy is frequently employed _ probably more frequently employed than ectopic pregnancy _ but is, strictly, incorrect _ in that it does not cover pregnancy which may take place within the cornu of the uterus (intramural pregnancy) _ which, with equal strictness, is ectopic pregnancy, in the sense that it takes place out of the normal site for pregnancy _ although it does take place within the uterine structure (yet not within the uterine cavity, as is natural).

The term "tubal pregnancy" is correct as far as it goes _ even covering those cases in which pregnancy occurs in the intra-uterine, or interstitial portion of the fallopian tube _ but does not cover those cases in which pregnancy occurs, as it sometimes does, entirely outside of the tube.

Cause of Ectopic Pregnancy.—This is too controversial to be gone into in a work of the present character. Briefly, if fertilization normally occurs within the uterine cavity, as formerly taught, the subsequent implantation and growth of the product of conception in some other locality must occur because of the escape from the uterine cavity of the fertilized ovum, subsequent to its fertilization _ because of some abnormal condition, or abnormal functionation _ possibly, of some unusual patulousness. Conversely, if union of the spermatozoön and ovule normally occurs within some part of the fallopian tube, probably in its ampullary portion _ for the assumption of which there seems much reason _ then the subsequent non-arrival and implantation of the fertilized ovule within the cavity of the uterus must, again, be due either to some abnormal condition, or abnormal functionation _ possibly, to some unusual barrier.

Varieties of Ectopic Pregnancy:

Tubal.
Ovarian.
Abdominal _ Primary and Secondary _ and occurring in connection with other structures than tube or ovary.

Sites of Ectopic Pregnancy:

(*a*) In the interstitial (intramural) portion of the fallopian tube _ tubo-uterine pregnancy _ the fourth most common site (Fig. 6366).
(*b*) In the isthmal portion of the tube _ second most frequent position.
(*c*) In the ampullary portion of the tube _ most frequent locality (Fig 6367.

(*d*) In the infundibular portion of the tube – third most common form.
(*e*) Between the tube and ovary – tubo-ovarian – the tube and ovary each contributing to form part of the sac.
(*f*) Within the ovary – fertilization of the ovule occurring within a graafian follicle – fifth most common site.

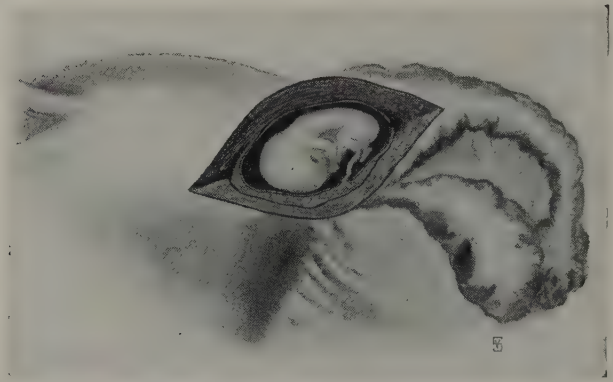


Fig. 6366.—Interstitial, or Intramural Pregnancy – occurring in the cornu of the uterus. The tube and gestation sac are merely split open.

(*g*) Intraligamentary – originating within the tube, but growing between the leaves of the broad ligament – usually bulging out more prominently either the anterior or posterior leaf.
(*h*) Abdominal – Primary: – Finding original fertilization and implantation upon intestines, mesentery, omentum, or broad ligaments – exceedingly rare.

Fig. 6367.—Ectopic Gestation – beginning as tubal pregnancy – and becoming intraligamentary pregnancy – by the growth of the sac between the leaves of the broad ligament. The front of the sac is removed. (Redrawn from Kelly.)

(*i*) Abdominal – Secondary: – Falling upon and finding implantation upon intestines, mesentery, omentum, or broad ligaments – after fertilization elsewhere – the usual type of abdominal pregnancy.
(*j*) In unusual compartments of malformed uteri.

Terminations of Tubal Pregnancy – may occur in one of the following ways:

(*a*) Death and absorption of the fecundated ovule, without symptoms.

(*b*) Tubal Abortion – breaking of the gestation sac into the lumen of the tube, without rupture of the tube, and the product of conception escaping along the lumen and through its abdominal end –

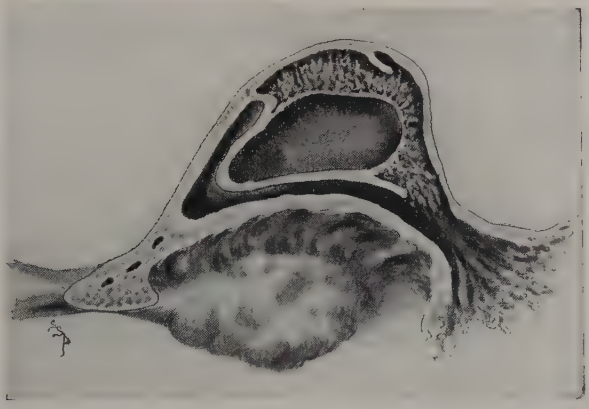


Fig. 6368.—Intraperitoneal Tubal Abortion Through the Normal Passages; – The ovum escaping into the lumen of the tube, and thence into the abdominal cavity, through the outer end of the fallopian tube. (Figs. 6368–6370 modified from Bumm and Blacker.)

the commonest happening (Fig. 6368). Hemorrhage occurs only from within the tube, and may escape from either patulous end. or, if retained, form a mole, or tubal hematoma

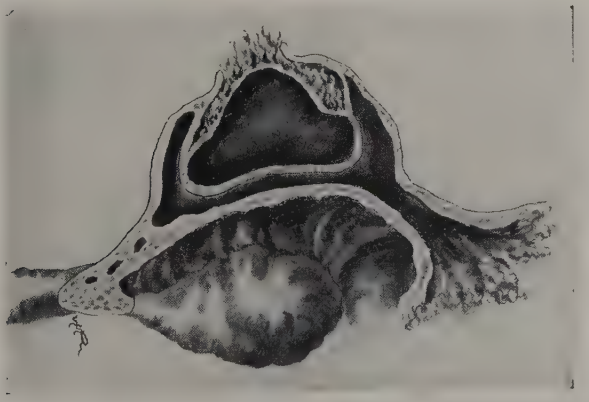


Fig. 6369.—Intraperitoneal Tubal Abortion by Rupture Through the Wall of the Tube; – the ovum passing directly into the peritoneal cavity.

(*c*) Tubal Rupture – breaking of the gestation sac through the wall of the tube (Fig. 6369) – with more or less complete escape of its contents, usually into the abdominal cavity – frequently with severe hemorrhage, from the lacerated sac and tube. Two forms of laceration may occur:

(1) Intraperitoneal rupture – into the free peritoneal cavity. The fetus may die – or, if the entire product of conception escapes, a new implantation may occur – or, if the decidua remains *in situ* and the cord is preserved, the fetus in its new site may continue to receive nourishment from the placenta in its old site.

(2) Intraligamentary and, at the same time, extraperitoneal rupture – constituting either broad ligament pregnancy (if the fetus survives) – or broad-ligament hematoma (if the fetus dies) (Fig. 6370).

Fig 6370.—Extraperitoneal Tubal Abortion – the ovum rupturing through its inner confining wall, into the connective-tissue plane between the leaves of the broad ligament.

(*d*) Tubal mole, or hematosalpinx – hemorrhage within the tube, whose ends become closed.

(*e*) Continuation of the growth of the fetus, throughout any number of months, or exceptionally, up to full term – resulting, sometimes, in the surgical delivery of a living child (though very rarely, owing to the limited distensibility of the tube) – the pregnancy remaining either

(1) Tubal – fetus remaining in the tube – or

(2) Tubo-abdominal – partly in the tube and partly in the abdomen – or

(3) Tubo-ligamentary – partly in the tube and partly between the leaves of the broad ligament.

(*f*) Death of the fetus – which may become mummified (desiccated) – calcified (lithopedion) – or a mass of adipocere (surrounded by fatty wax) – or may become infected and thrown out of the abdominal cavity, by spontaneously sloughing its way through (usually by way of the rectum).

Terminations of Ovarian Pregnancy – may be one of the following:

(*a*) Death of the fetus, with or without the formation of a hematoma.

(*b*) Rupture of the gestation sac. (Abortion does not take place, as in tubal pregnancy.)

(*c*) Continuation to full term – which is more likely to occur than in tubal pregnancy, because of there being more room for growth.

Terminations of Free Abdominal Pregnancy.—The original and primary implantation and growth of the fetus may be upon the structures within the pelvic cavity, other than those of the ovario-tubo-uterine tract – but is usually

so secondarily, having escaped from the site of its impregnantion and first growth _ and, in the latter case, may either be expelled from its first site whole and intact, retaining no connection, or, as is more usual, may retain funicular connection with its placenta still growing at the site of first implantation. Here, too (as upon the ovary), the fetus has more room for development than in the tube, and may go further toward full term _ even to the delivery of a living child. The fetus may also perish at any period of its intra-abdominal life.

Forms and Sites in Which Hemorrhage of Ectopic Pregnancy Usually Occur:

(*a*) Diffused Hemorrhage:
1. Continuing hemorrhage _ into the open peritoneal cavity.
2. Continuing hemorrhage into the parametria, or into the connective-tissue planes of the abdominopelvic wall.

(*b*) Encysted, arrested Hemorrhage; _ localized within the connective-tissue planes of the parametria, or of the abdominopelvic walls _ usually a secondary stage of "(*a*) 2," above.

(*c*) Pelvic Hematocele, of ectopic origin; _ artificially walled-off, quiescent collections of blood, within the free pelvic peritoneal cavity _ para- and peri-tubal, and para- and peri-uterine _ retro-uterine collections being the commonest.

(*d*) Pelvic Hematoma, of ectopic origin; _ anatomically walled-in, quiescent extraperitoneal collections of blood in the parametrial and pelvic wall connective-tissue planes.

(*e*) Suppurating hematoceles and hematomata.

Frequency of Ectopic Pregnancy _ and Delivery of Living Children.—Probably a very much larger number of ectopic gestations occur than has been generally supposed. Shears writes _ "Perhaps it is not too much to say that 1 per cent. of all pregnancies are extra-uterine."

Sittner collected 122 cases of children born alive of ectopic pregnancy _ of whom 59 died within four weeks _ 14 more died within the first year _ 8 more within the second year _ 18 were lost sight of _ and 23 were reported alive and well at various subsequent periods.

Generalizations.—In the various forms of ectopic gestation, the uterus undergoes some degree of enlargement, and contains a decidua.

Combined intra- and extra-uterine pregnancies may take place _ as well as multiple ectopic gestation.

Final universal concurrence of view, as to primary abdominal pregnancy, (has not been reached. Good men state that primary abdominal gestation including ovarian pregnancy) is now no longer recognized _ and equally good men counterstate that primary abdominal pregnancy can now no longer be doubted. The question is, admittedly, a difficult one _ as when the former set of men may interpret as primary abdominal pregnancy one in which the fetus was originally implanted upon the fimbria of a fallopian tube, and then lost its filamentous connection, so that, when found, only connection with some distant structure was demonstrable _ while another set of men would hold that from the first that this pregnancy was secondary, having severed its connection with its original implantation. Equally might the controversy turn upon whether or not a fecundated ovum had ruptured through the wall of a tube, intact, and formed attachments elsewhere _ the wound of rupture being no longer recognizable. Irrespective of these various contentions, however, the trend of judgment seems to be that primary abdominal pregnancy does occur.

A large number of cases originally described as primary abdominal pregnancies, were, without reasonable doubt, secondary engraftments upon neigh-

boring, or distant structures, after the escape of the sac, by rupture, from its site of primary implantation.

An ovum expelled in its entirety from the tube usually dies – though, exceptionally, it may form new attachments and survive. On the other hand – and especially where pregnancy has made some progress – the fetus may escape – the placenta retaining its original implantation and continuing to furnish nourishment, through the unbroken cord. The fetus, in these cases, may retain its fetal membranes – but, on the other hand, may not.

Tubal abortion is more frequent than tubal rupture – occurring in about 25 per cent. of cases. The gestation sac ruptures within the tube into its lumen – but not through the wall of the tube. The whole, or part of the ovum may be extruded from the tube. When the expulsion is complete, hemorrhage is usually slight. When the expulsion is incomplete, hemorrhage is apt to continue in drop form – generally resulting in pelvic hematocele. Quiescence is not apt to be reached in incomplete abortion. Tubal abortion, early and with but little bleeding, may furnish few symptoms – and is probably very often overlooked. The hemorrhage of tubal abortion may escape from either, or both patulous ends of the tube. When bleeding continues within the tube for a time, and then stops, a tubal mole is usually formed.

Tubal rupture – in which the tube yields and gives away – usually occurs fron the sixth to the tenth week. Hemorrhage generally takes place into the free peritoneal cavity – or, extraperitoneally, between the layers of the broad ligament.

Pelvic hematocele is almost always traceable to ectopic gestation.

The most destructive element to the normal progress of ectopic gestation, and the usual cause of its termination, is hemorrhage into its component structures – and the most serious element of danger to the mother, is hemorrhage. Thus the Surgeon's chief efforts are directed toward the control of bleeding. As the majority of operations are performed early it is rather the rule that the fetus is never seen – having escaped from the sac in the rupture – and generally being removed among the blood-clots, unseen. Further, the now known much greater frequency of ectopic gestation than formerly supposed – all go to place upon the Surgeon the responsibility of judgment and promptness of action in those cases which call for operation.

OPERATION FOR ECTOPIC PREGNANCY

Operation in General.—Operation may be for the purpose of removing the product of ectopic gestation, early in the course of development, and before the occurrence of phenomena bespeaking the urgent necessity of such removal (if, happily, the condition be discovered this early); – Or the operation may not be performed until after the occurrence of phenomena demanding immediate interference, such as rupture, with bleeding – the operation then being more directly for the result of the ectopic pregnancy, than for the pregnancy itself, namely, the arrest of life-endangering hemorrhage; – Or the operation may be performed at the full term of the child – both for the purpose of delivering a viable child, and in order to conserve the mother. It will, therefore, be seen that there is no one fixed classical type of operation for ectopic gestation – but that the surgical procedure will vary in scope and in technic according to the stage of pregnancy, the site and nature of the individual form of ectopic pregnancy in the individual case, and the presence or absence of active phenomena at the time of operation.

It would seem as though there might be no difference of view over the primary question as to whether an operative, or a non-operative course is to be

adopted. In cases in which there is definite, immediate danger, with progressive symptoms, there is no question. It is in the borderline cases that question arises. The probable explanation of the reason that there is ever any question at all, arises from the fact that a considerable number of ectopic abortions and ruptures take place, and recover without operation — nature in these cases disposing of the products by shrinkage and absorption. On the other hand, many patients lose their lives within a few minutes, from hemorrhage and shock — where it is not a question as to whether to operate or not — but before any operative procedure can be undertaken.

An argument advanced by those who sometimes oppose operating immediately upon diagnosis and without imperative symptoms, is that, by such a course, the child's chances are entirely ignored — which, in view of the fact that so many children of ectopic gestation have been delivered alive by operation, they contend should call for consideration.

It is the view of the Author that operation should be performed, in all cases, as soon as the diagnosis is made, where no symptoms exist — and immediately symptoms reasonably simulating ectopic pregnancy occur, in those cases in which diagnosis has not been independently made — and that the greater safety to the mother should outweigh all consideration of the child. Unfortunately, it is exceptional for diagnosis to be made without symptoms — and these symptoms are, usually, rupture.

The general features of the different category of cases in which operation is called for, will be briefly considered. Following these, will be given the salient features of a case of repeated ectopic gestation, followed in each instance, by operation — which came under personal observation.

Operation for Early Ectopic Pregnancy, Prior to Abortion, or Rupture. —Operation at this stage is rare — for the reason that it is unusual to detect ectopic gestation until rupture or abortion leads to its discovery. Tubal abortion frequently goes by and convalescence becomes established without recognition at any stage — the phenomenon being put down to some irregular menstrual manifestation. Tubal rupture, however, is due to make its occurrence manifest by phenomena only too pronounced to escape notice — although, at the time, they may escape proper interpretation.

Sometimes, however, diagnosis is made in advance of either abortion or rupture — and, when this is the case, operation should be performed as soon as arrangements for it can be made. The possibility of temporizing until term, with the hope of saving a living child, should not be considered — and, apart from the fate of the pregnancy, the chances of the mother are infinitely better in an operation performed in a quiescent stage — as compared with one after rupture.

The operation performed before abortion, or rupture, performed for the purpose of anticipating these, is usually one of the three following:

Salpingotomy, with removal of the sac, and suturing of the tube: — In a sense — that is, theoretically — this is the ideal technical step — to incise the tube wall over the gestation sac, remove the entire product of conception, and restore the integrity of the tube and its lumen by suturing together the incised wall — and this procedure is contended for by some Surgeons — and the wisdom of it has not been adequately disproved.

Partial salpingectomy including the gestation sac: — This, or the following type of procedure, is the technic most frequently employed. It is accomplished in exactly the same way as already described and pictured (v. p. 563) in connection with the partial removal of the fallopian tube for a small tumor, by simple, or wedge-shaped excision of a segment of the tube, including the tumor — but including, in this case, the gestation sac (Fig. 6371). In the ac-

curate suturing together of the opposite ends of the tube and of the broad ligament (the vessels of the latter having been ligated), the lumen of the tube is likely to be restored – for it must be remembered that it is often restored even after the planned effort to prevent its restoration by double ligation – and, even in those cases where it is not restored, the patient is in no worse condition than in the following procedure:

Total salpingectomy, including the gestation sac: – This is, probably, the most frequently employed method – and the steps are precisely the same as described and illustrated in connection with total excision of the fallopian tube for tumor, or for distention by fluid (v. p. 568). It would, however, not seem necessary to remove the entire tube, if the limited period of development made the removal of a part of it suffice.

Fig. 6371.—Excising the Product of Tubal Pregnancy – a knife is seen outlining the area of the enlarged tube, in the broad ligament – and within the ends of the enlarged area, which have been previously safeguarded by ligatures. The resulting raw bed will be sutured.

Operation for Ectopic Pregnancy, after Rupture, or Abortion.—Operation after rupture or abortion (the latter sometimes being accompanied by as severe phenomena as is rupture, and often being indistinguishable from it), is to arrest hemorrhage, counteract shock, repair the ruptured site (in the case of rupture), and remove the product of conception and the outpoured blood.

Formerly, the time for operating for ruptured ectopic gestation was the time, at once, of its discovery, or serious suspicion. More laterally, much controversy has arisen in this connection – based, presumably, upon the knowledge that many cases of ruptured ectopic gestation have recovered without operation, with the spontaneous absorption of effused blood, and disposal, by shrinkage and other changes, of the escaped products of conception. The matter is further complicated by the absolute inability of determining what proportion of the seriousness of the case is due to hemorrhage, and what to

shock – for while shock is the end-result of hemorrhage, one, if he knew, could better afford to await lessening of shock and betterment of condition, if the hemorrhage which caused the shock were stopping, while if it were known that hemorrhage were continuing, shock, instead of getting better, would be getting worse – and valuable time would be passing – or might be altogether lost. It will thus be seen that patients' lives can be lost by the mere fact of operating upon them when in bad condition – that they can sometimes be saved by temporizing until they are gotten into better condition before operating – and that, on the other hand, the only opportunity may be lost by thus waiting.

All of this means that it must, after all, be a matter of individual judgment in the individual case, as to the best time to operate – or, in some exceptional instances, as to whether operation should be performed at all. The consideration must also be weighed, as to whether the chances are made better or worse – in borderline cases of gravity – by operating, or not operating – if the equipment of the Attendant is not up to the mark, and if the surrounding conditions are adverse. It would seem that the time to operate, is when symptoms are bad, and getting worse, – and that the time to temporize, for even more favorable time, is when symptoms are bad, but getting better. In proportion as the picture-complex is due to shock from continuing, or increasing hemorrhage, is immediate operation indicated – and in proportion as it is due to shock, with lessened, or ceased hemorrhage, is delayed operation warranted, if not, sometimes, contraindicated.

In final summary, it may be said that the best immediate results, as to life itself, in average cases, follow immediate operation. In Schauta's collection of 123 cases operated upon, the mortality was 5.7 per cent. – and that in the 121 cases treated non-operatively the mortality was 86.89 per cent. Further, the subsequent health of patients who have recovered from ectopic gestation, in which operation has been performed, has been shown to be better than the health of those who have recovered without operation.

Operation in these cases should be of the simplest sort – the abdomen should be opened in the median line, suprapubically – the bare needs of the emergency securely and thoroughly accomplished – and the abdomen expeditiously closed – remembering that one is dealing with a local condition plus shock – in which shock may turn the tables against the patient, even though the technical side of the surgical procedure be most perfect. The operation under stress, may have to be performed in the patient's bed – after a wash-over of the otherwise unprepared abdominal wall with the tincture of iodin. Where, however, time for rallying and better preparation generally are given, the better is the outlook.

In dealing with a ruptured tubal pregnancy, the exposure of the field is aided by the Trendelenburg position, as soon as the abdomen has been opened – the opening of which may be followed by a gush of blood, from the amount collected within the abdominal cavity. If much liquid and clotted blood be present, some of this may have to be removed before satisfactory exposure can be secured. Clots must usually be scooped out of the abdomen – while liquid blood can generally be satisfactorily removed by a well-working suction drain, which has the advantage of demanding little room and of going on with its work while the rest of the operation proceeds. When the site of rupture has been demonstrated – or sometimes by touch, without the aid of sight, a clamp is applied proximally to the tube and adjacent broad ligament, and another distally to the site of rupture – and these may be so inclined as to almost, or quite meet in the broad ligament below the tube. In this manner, further bleeding is arrested – and one may proceed with somewhat greater leisure – though expeditiously still – and, above all, with thoroughness.

The general type of procedure is either a partial excision of the fallopian tube, along with the ruptured sac (v. p. 657) – or the total excision of the tube, together with the more or less intact, or disorganized sac, as the case may be. All vessels which feed into the site, from both sides of the rupture, are tied off – usually with No. 2 chromic catgut. The ligatures are applied to the outer sides of the clamps – and may not be able to be satisfactorily tightened until the clamps are released. The lacerated tube and sac are then excised safely within the ligatures – after which, the opposite margins of the severed tube and broad ligament, in the case of a V-shaped excision, are brought together – or, in the case of a total excision of the tube, the free margins of the remaining broad ligament are brought together by suture. This usually concludes the technic at the site of damage. Whether attempt be made to carry the examination further, or to remove more of the blood from the pelvis than already removed, will depend largely upon the condition of the patient. Sometimes, especially in desperate cases, no special attempt is made to remove the effused blood at all – nature apparently readily disposing of it.

The ovary may be so involved in the adherent mass, that its simultaneous removal is also necessary – in one mass, along with the tube and gestation sac. Such an operation will then often resemble the removal of a complicated ovarian cyst (v. p. 536) – or the removal of a broad ligament cyst (v. p. 585).

If the gestation sac be situated very close to the cornu of the uterus, a cuneiform portion of the adjacent uterine wall may have to be also excised – followed by repair of the uterus by suture.

This same technic of cuneiform excision of the horn of the uterus may be required – and is much more distinctly required – where the ectopic pregnancy is interstitial – occurring actually within the wall of the uterus. The procedure of repair is then the same as after excising the uterine end of the fallopian tube (v. p. 563).

In cases of interstitial pregnancy, supravaginal hysterectomy (v. p. 639) has sometimes been performed, as the best method of meeting some difficult cases – and, occasionally, the entire uterus has been excised.

In ruptured, advanced cases of ovarian pregnancy, the removal of the entire ovary, together with the gestation sac, is generally required.

Simultaneously with the conduction of operations performed for rupture of the sac, saline infusion must often be given, intravenously, or by hypodermoclysis.

Abdominal Operation in Advanced Ectopic Pregnancy, with a Dead Child.—When the course of events has been followed, and the cessation of the child's heart-beat, as well as other phenomena, indicate that its death has taken place, it becomes a question as to whether immediate operation should be undertaken for the removal of the child and the products of pregnancy – or whether several weeks or a couple of months should be allowed to pass before operating, during which time the placental circulation will have very much decreased, or entirely ceased. Differences of view have prevailed upon this question – with consequent opposite courses of action. Hemorrhage from the placental site constitutes one of the chief problems in operating in advanced ectopic gestation – while, on the other hand, during the period of waiting for the shrinkage of all structures, including both child and placenta, following the death of the child, there must be faced the inherent danger of infection and suppuration – which constitute a real danger, in spite of the fact that nature has often shown wonderful powers in converting the whole field of ectopic pregnancy – child, gestation-sac and placenta – into a quiescent mass of lithopedion, or adipocere, in part – while disposing of some of the development by shrinkage and absorption. The Surgeon will have to use his judgment in

mapping out the course in these cases. Probably here, as so often applies, an intermediate course is better than operating immediately after death – or delaying until suppuration may intervene. The features to be contended with in an intermediate operation for advanced ectopic pregnancy, say two months after the death of the child, will more largely resemble those of full-term operation in ectopic gestation (v. i.), than they will those of early operation, prior to rupture – except that the elements of size and active vascularization will be distinctly less.

Abdominal Operation in Ectopic Pregnancy, at the Full Term of a Living Child.—The operation by the median suprapubic route, here assumes the type of one for a large, probably complicated, pelvic tumor – animated, in this case, by the new-being life of the tumor. The difficulties to be encountered in the case will largely depend upon the situation of the pregnancy – and especially upon the position and extent of the placenta – and the dangers arise chiefly in connection with the placenta. The object is, to deliver a living child, and entirely remove the placenta and the gestation sac. The placenta and sac cannot always be removed at the time of removing the child – and, if they cannot, must be drained until they do come away, or are removed. The placenta may be adherent over a very large and important surface, as in the tubo-abdominal type of pregnancy – making its immediate removal entirely impossible, although the child may be readily removed.

If the attachment of the sac and placenta be limited, and such that its immediate environments may be controlled by ligature of the supplying branches of ovarian and uterine vessels, and its adhesions to relatively unimportant structures are separable, then there should be no insurmountable obstacle to excising the mass and repairing the bed by suture as well as possible. If the opposite conditions exist, then it is quite another matter. Sometimes the uterus itself must be amputated supravaginally – or even totally – so involved is it in the immediate field. Sometimes the placenta can be removed from the sac – and then the sac be removed. At other times only the placenta can be removed and the sac must be packed – the packings being brought out of the abdomen. Sometimes neither can be removed, but must be packed and drained through the abdominal wall – the margins of the sac being sutured to the margins of the abdominal wound, if possible. Sometimes bleeding sites must be clamped and the clamps temporarily brought out of the wound. The packings in these cases usually remain *in situ* for four or five days – being removed by degrees. This method amounts to a form of marsupializtion. The difficulty of dealing with some of the sacs is increased when extensive adhesions to coils of intestine are present. The method of marsupialization is safer than the one, sometimes adopted, of suturing up the sac, after the delivery of the child, and leaving it *in situ*, in hope that it will be shrunken and absorbed by nature.

Sometimes the placental attachment is so extensive and spread out, that it cannot be dealt with by suture to the abdominal wall. In these cases the placental site is minimized as much as possible, and is then gauze packed, coffer-dam fashion – the gauze packings being brought out of the abdominal wound. The region is thus walled off by adhesions – and is kept packed – and, after several weeks, as usually happens, the placenta may separate, or be separated instrumentally and digitally – and the cavity caused to heal from the bottom.

Operation by the Vaginal Route, in Ectopic Pregnancy.—Operation for ectopic pregnancy by anterior vaginoperitoneotomy (v. p. 372) is sometimes performed – and has been warmly advocated by Duehrssen – but is distinctly inferior to approach by the abdominal route.

Operation for Pelvic Hematocele, of Ectopic Origin, by the Vaginal Route.—The collection of blood, here considered, is the result of an antedating tubal abortion, or of the rupture of some type of ectopic gestation sac – which, as the symptoms often not understood at the time, assume quiescence, become walled in by peritoneal adhesions – usually in Douglas' culdesac – and is evacuated through a posterior vaginoperitoneotomy incision (as described and pictured on pp. 377–380). The abdominal route is preferred by many Surgeons, as affording an opportunity of investigating the organs – unless infection be present.

Report of a Case of Repeated Tubal Pregnancy of Opposite Sides, Submitted to Operation.—An unusually interesting case of repeated ectopic gestation – grave in occurrences, but ending fortunately – occurred in the practice of the Author. A telephone call came from the country – to see Mrs. X – an admirable type of cool, calm, sensible patient, aged about thirty-nine – who, on going to breakfast, on the morning of January 16, 1919, suddenly experienced discomfort in her left side, compelling her to lie down. It was impossible to reach her until six hours later (nor was the indication for doing so made plain over the telephone) – when a picture of extreme collapse presented itself – cold, clammy surface – yellow pallor – no pulse whatever detectable at wrist – general abdominal discomfort, but not markedly localized – some dulness in the flanks – nothing definite revealed by vaginal examination, though the suggestion of possibly more than normal resistance above the left lateral fornix.

The Writer arrived on the scene with nothing but a pocket-case and a hypodermic – and it was three or four hours before help for operation could be gotten from the nearest center. In the meantime, warmth and stimulation had revived the patient somewhat, and had made the pulse detectable. Dr. F. E. Sondern, of New York, had hurried, in the interval, to the scene – and taken blood for examination (which was not easy to secure in this case). Simultaneous with his telephonic report of a drop to 4,100,000 red blood-cells, with leukocytes, 28,000, with no other abnormality, and the expulsion of a uterine decidua into the vagina, reasonably clinched the already advanced diagnosis of ruptured ectopic pregnancy.

Dr. Edward J. Ill, of nearby Newark, who kindly responded to call, with full surgical equipment, assisted by his Son and by the Writer, operated upon the patient, in her bedroom – as promptly as arrangements for operation could be improvised. The abdomen was opened by median suprapubic incision. Blood welled through the incised peritoneum at once. A considerable quantity of liquid and clotted blood was found in the abdominal cavity – which was scooped out by double handfuls, and sponged away. The fetus was never seen – and was probably removed in the clots. The left fallopian tube was found ruptured – but whether in the isthmian, or ampullary portion, was not recorded – nor the probable age of pregnancy. Hemorrhage was still continuing from the broken surfaces of the tube. The remnants of the sac were separated in the manipulations. The lacerated tube was ligated, distally and proximally – and the pelvic basin expeditiously sponged – and the abdomen closed. Record also fails to show whether the patient received an intravenous, or hypodermoclytic saline infusion – but the Writer's memory is, that saline solution was administered. The patient progressively rallied, following return to bed – and continued an even and uninterrupted convalescence – with the exception of limited but prolonged superficial wound suppuration, which prolonged her stay in bed to several weeks. Normal health and menstrual life followed this first ectopic gestation – and continued until her second similar mishap, upon the opposite side.

On March 14, 1921, Mrs. X came to the office – not brought by any subjective or objective symptom, or discomfort – but simply prophylactically, as it were – to be examined on general principle – prior to a contemplated long railroad trip to her Southern plantation home – where, incidentally, she planned to enjoy horseback riding. Her trip to the office proved both a misfortune and a blessing to her – the latter feature, I hope, from the practical standpoint, predominating – in view of a possibly, indeed probably, much worse mishap, which might have followed a little later – without the immediate accessibility of help – the absence of which, at the immediate time, had so nearly cost her life, upon the first occasion. In the routine of gynecologic examination, the still present intrapelvic adhesions of the old ectopic gestation were plainly felt on the left. On the right, no special feature was *brought out*, objectively, by an ordinarily but not extremely conducted bimanual (combined intravaginal and extra-abdominal) examination – but, nevertheless, evidently *something was distinctly accomplished*, and *subjectively realized* – (serving, in this case, as an unhappy conviction and practical demonstration of what a bimanual examination is *capable* of accomplishing, even if, of not revealing – the value of which for good, and the potency of which for harm, had not been theretofore fully impressed upon the Author). This bimanual technic was the last feature of the examination – and elicited no comment from this unusual patient, at the immediate time. She at once arose from the table – and sat down in a rocking-chair at its side – saying, immediately afterward, "Doctor, you have done something to me." As I had never known her to be in error, in many years of contact, I heeded her remark more than I ordinarily might have done – especially as her face showed pallor and distress. She was immediately helped into an adjoining room, to a lounge – the phenomena of shock rapidly increasing – discomfort in the right flank growing more marked – and pulse becoming almost imperceptible. Under warm coverings, hot-water bags, morphin and atropin hypodermically, and brandy and hot black coffee, the clammy coldness was lessened; relief of suffering secured; psychic calm, remarkable as it was, made greater; and pulse increased (as probably, also, the hemorrhage, under stimulation – the responsibility for which, however, having to be shared with the opposite demands made by shock).

The diagnosis of a ruptured right ectopic gestation was at once made – in which diagnosis, Dr. Henry H. M. Lyle, who kindly responded to telephonic call, concurred. The patient was at once transferred to St. Luke's Hospital, by ambulance – her husband arriving upon the scene just before her departure.

No reaction to any marked degree of betterment, followed her being temporarily put to bed, pending preparation for operation. The blood-count, made in the interim, showed a drop to 3,500,000 red blood-cells per c.mm. As soon as preparations could be completed, the Author, aided by Dr. Lyle, opened the abdomen, by the median suprapubic route. The diagnosis was further corroborated, before the peritoneum was incised, by the appearance of a quantity of dark blood through the transparent structure. As soon as this was incised – the patient put into the Trendelenburg position – the fundus of the uterus, grasped by uterus-holding forceps, brought into the wound – and some of the blood cleared away by sponging and suction drainage – a rupture of the isthmian portion of the right fallopian tube was plainly seen. The product of conception never came to view. The adhesions resulting from the first ectopic gestation, were revealed. Only a limited amount of bleeding was continuing, when the abdomen was opened. The tube was clamped proximally and distally and the cavity further dried of blood – which, while considerable, was less than the very great amount found at the rupture upon the left side, fourteen months before – when the bleeding had continued through

a much longer period. In the manipulations, a small mass of tubal tissue, decidua, and clotted blood came away from both the uterine and from the distal end of the exploded tube _ leaving rather clean ends. There was a limited tear into the broad ligament, from which bleeding continued _ whether the result of manipulations, or whether partly due to an intraligamentary phase of the ectopic gestation, was not determinable. The lacerated tube was ligated on both the proximal and distal sides of the rupture with No. 2 chromic catgut. Bleeding, however, was not satisfactorily controlled until the proximal aspect of the ruptured tube, including its underlying broad ligament, were turned mediad, and sutured to the lateral uterine wall _ (which accidental technic (Fig. 6372) may prove helpful in counteracting nature's effort to re-establish continuity of lumen between the proximal and distal ends of that tube _

Fig. 6372.—Method of Folding the Ligated Proximal End of the Fallopian Tube Mediad and Suturing it to the Lateral Wall of the Uterus _ in operating for rupture of the tube, in ectopic gestation _ to minimize danger of recurrent pregnancy from that side. A technic once resorted to by the Author.

thereby restoring direct communication with the right ovary _ with the possibility of a subsequent pregnancy, uterine or ectopic.

During the progress of the operation, starting with the opening of the abdomen, double submammary hypodermoclysis, of normal saline solution, was made. The rather thick abdominal wall was closed throughout _ by continuous No. 1 plain catgut suturing of the peritoneal margins _ by No. 2 chromic catgut interrupted sutures of the rectal muscles and aponeuroses _ by interrupted plain No. 1 catgut stitches of the fatty areolar tissue _ and by silkworm sutures of the skin _ followed by the usual abdominal dressing _ plus a binder.

Convalescence in this last ectopic pregnancy was not as uneventful as in the preceding one _ (where, it is true, the patient was kept in bed for about a month, but from obstinate though very superficial wound suppuration). In this last case, the patient had several ups and downs. The first few days gave promise of leaving the hospital in a week or ten days. On the sixth day

phenomena suddenly developed resembling acute gastric dilatation, of surgical type – with such abdominal wall distention, from intra-abdominal pressure, with its center in the gastric region, that the costal arches were forcibly bulged outward, and the entire abdominal wall elevated and rounded out – with considerable general disturbance to the patient. At the maximum of this distention, and after it had lasted more than an hour, the degree of distention seemed to force the cardiac orifice of the esophagus open, and hold it open, while wind continuously, and audibly, poured forth from it – and, simultaneously, from the anus. This relief began just as the usual measures were about to be undertaken for typical acute surgical gastric dilatation. It developed that the Day Nurse, contrary to directions (and, it may be said, not a St. Luke's nurse) had grossly overfed the patient the day before.

On the tenth or eleventh day, the patient developed a right lobular pneumonia – which manifested a moderate grade of development – improving and disappearing under, or coincidentally with, mustard applications.

The greatest annoyance to the patient, from her standpoint, was marked discomfort, and sometimes distinct pain, in the general subhepatic region – beginning the latter part of the first week, and continuing, at intervals during the next four or five weeks – the nature of which was never explained. The pain was, at times, very severe.

The abdominal wall contained considerable fatty areolar tissue – and, from the day of the operation, until within the week of her return home – a full month – threw out the largest amount of serous fluid the Author has ever witnessed coming from a wound. This first came out between the lower skin stitches – and then two of these were removed, for its easier exit. It remained a clear, simple serous fluid for more than a week – and then subsequently, when limitedly involved by infection, showed a predominance of serous over purulent make-up.

The patient left the hospital on the twenty-seventh day – in not an altogether satisfactory condition – suffering from her hepatic region pains – the wound discharging limitedly – with a degree or two of temperature – and with distinct leukocytosis and polymorphonuclear increase, which had been constant all through her convalescence – but with the conviction, in the mind of the Author, that cutting adrift from hospital – and from general surgical attentions – would be beneficial. This was fully corroborated. It was never necessary to see the patient at her home – and when she returned to the office – on the eighteenth day after leaving the hospital (the forty-fifth day after operation) her invalidism may be said to have definitely ended. Menstruation was subsequently resumed – as well as her usual excellent health.

Locally, the only present reminder of the last operation, is an unusual wound deformity, detectable only on standing – in which the upper part of the cicatrix comes to a blunt point, just above the middle of the wound – seen markedly in profile – and caused, apparently, by firm connection of the overlying cellulocutaneous tissues to the rectal aponeuroses, in the lower half of the wound, giving the fatty areolocutaneous tissues no free play in this region – while the upper half of the wound, normal in all respects, tends, on standing, to sag down over the firmly adherent portion. And this condition, in turn, is probably due to the double fact – that the abdomen was opened, in the second operation, directly through the median scar of the first operation (instead of excising it) and to the fact of the prolonged discharge of serum and seropurulent fluid from the lower half of the wound. It would seem that these adhesions might be subsequently freed – possibly, subcutaneously – if desired.

As to the patient's prior history, Mrs. X came to me in April, 1912, referred

by Dr. Rudolph Matas – with the phenomena of a gradually disappearing simple goiter.

On August 6, 1912, the patient had a spontaneous and unexpected miscarriage, of indeterminate age – of an illy nourished, macerated fetus – a body of apparently three to four months ,and a face of seemingly five to seven months – shriveled, and as though dead for some time. This miscarriage occurred before the patient could be reached.

On March 25, 1914, curetage of the uterocervical tract was performed – not because of pathologic indication, but because of its possible aid to pregnancy, which was desired – no normal pregnancy followed by delivery, ever having taken place, before, or since.

The above case may be taken as a unique instance of a Surgeon's personally producing – in this case, fortunately – the climax of a condition – which his immediately following operation set about to counteract, and to radically repair. Nor is it to be overlooked that in thus unintendingly and unconsciously serving the really best interest of his patient, the Surgeon's very act – in the case of a different type of patient – might have been followed by resentment, and even by suit – had there been absent the rational understanding and full conviction that, sooner or later, in any event, the operation would have been inevitable – as demonstrated in the first ectopic gestation – and that the adverse circumstances under which the patient might then have found herself, might have represented the cost of life itself.

CHAPTER XCVI

OPERATIONS ON THE NEWBORN

Freeing of the umbilical cord, twisted around the child's neck, at the time of expulsion – either by manipulation or by clamping and division, p. 911.

Ligation of the umbilical cord, p. 911.

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FREEING OF THE UMBILICAL CORD TWISTED AROUND THE NECK, AT THE TIME OF EXPULSION

As soon as the head is born, the hand should be carried around the neck of the child, to ascertain whether the cord is encircling the head – a single loop often surrounds the neck, and, sometimes, two. If a loop be found about the head, it may be encircling it so loosely, that it is an easy matter to practice a little additional traction upon it – sufficient to give enough play to enable the loop to be quickly lifted over to the opposite side of the head, thus freeing the neck of its encirclement (Fig. 6373).

Fig. 6373.—Freeing the Umbilical Cord from Around the Neck, in the Act of Expulsion of the Head – first loosening it by slight traction, and then slipping it over the head.

Upon other occasions, however, and in spite of prompt action, the cord may be so short, or so tightly applied, that no sufficient slack of the loop can be secured to enable it to be carried over the head. In addition to inability to secure enough length of free cord to pass the loop over the head, the circumstances of the case may not afford time for even doubly ligating and dividing the cord. Under such conditions, all that one may be able to do at the time is to doubly clamp the cord, divide it – and proceed with the expeditious delivery of the child – performing the technical ligation later.

LIGATION OF THE UMBILICAL CORD

The tying of the cord should, under average conditions be carried out without haste, as it lies between the limbs of the mother. It is desirable to first

give the child a chance to aërate its lungs, by crying out. It is also well to wait until the pulsation in the cord has entirely, or almost completely ceased – the child thereby receiving the two or three additional ounces of blood which it is due to get from the placenta.

Double ligatures are always applied upon the cord, before division between them. The proximal ligation is to prevent bleeding from the child. The distal ligation is fourfold in purpose – to safeguard a twin, in the event one be present – to save blood to the mother, if the placenta be still attached – to prevent the emptying of the placenta if it be detached (it being harder for the uterus to expel an empty than a filled placenta) – and to prevent needless soiling of the mother's environments.

Fig. 6374.—Double Ligation and Division of the Umbilical Cord – I; – "Stripping" the cord, to remove the excess of Wharton's jelly, thereby diminishing its size – preparatorily to ligation.

The cord is taken up between the thumb and first finger of each hand, and "milked" proximally and distally from a point midway between, for the purpose of lessening the bulk of the cord (Fig. 6374). The proximal ligature is now placed at a point from 2.5 to 3 cm. (1–1¼ inches) from the child – and the distal ligature, about 2.5 cm. (1 inch) distal to the first (Fig. 6375). Stout twisted silk, sold as umbilical cord silk, will make the tightest knot – and plaited silk is probably next best. There has never seemed any more reason for using tapes for tying the cord than for tying vessels. The cord is then divided by stout scissors – sufficiently far distal to the proximal ligature to enable a second ligature to be applied, on either side of the original ligature, if considered necessary, later on. The cord is divided between the ligatures with stout scissors.

Special forms of angiotribe-like clamps are sometimes employed – and are

especially useful, in that they compress the cord in the site where the ligaturse are to be applied – making ligatures thus placed more secure (Fig. 6376.) Very stout cords tied with rather thin silk have been known to be cut through – either in the tying, or subsequently. Children have often lost their lives,

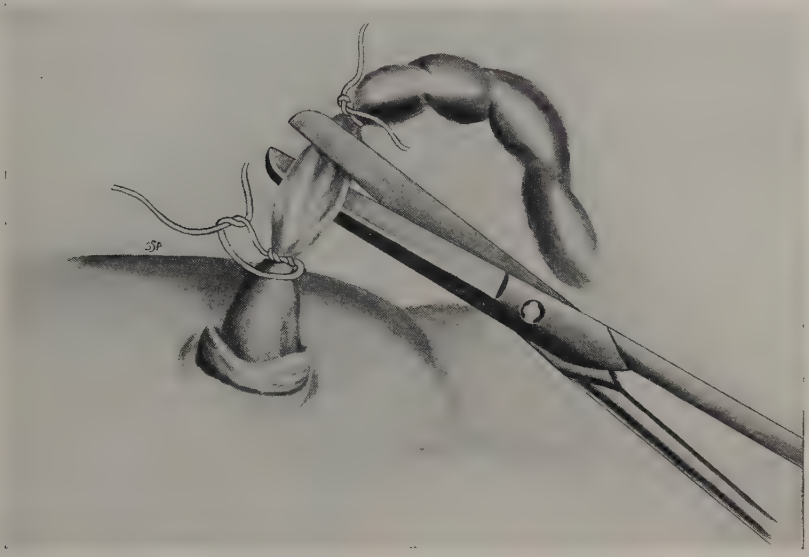

Fig. 6375.—The Same – II; – Double ligation of the cord, proximally and distally to the navel – followed by division of the cord between the ligatures – leaving ample length of cord distal to the proximal ligature so that the ligature cannot possibly slip off.

from imperfectly tied cords, through hemorrhage – apart from the large number who have died of infection through this channel – and the considerable number who have been involved in lock-jaw through the same source.

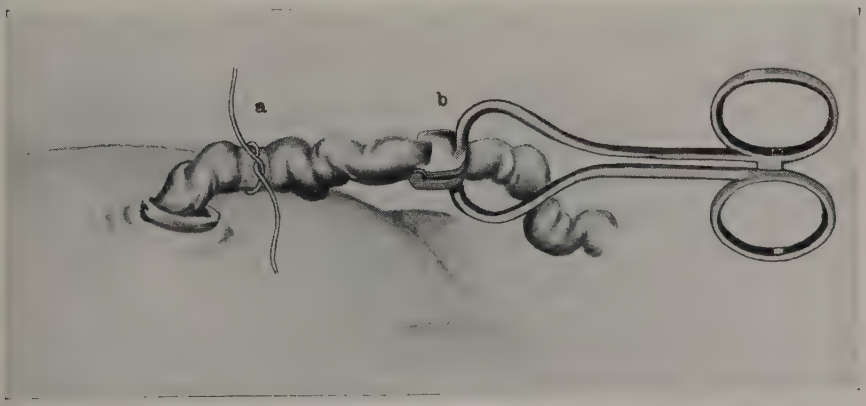

Fig. 6376.—Control and Compression of the Umbilical Cord by Jagerow's Omphalotribe.

It sometimes happens that it is indicated to hurriedly separate the child from the mother, following birth – in which time is not given to deliberately tie the cord at once. Under such circumstances, two clamps should be quickly applied – the proximal one a little further from the child than usual – and the

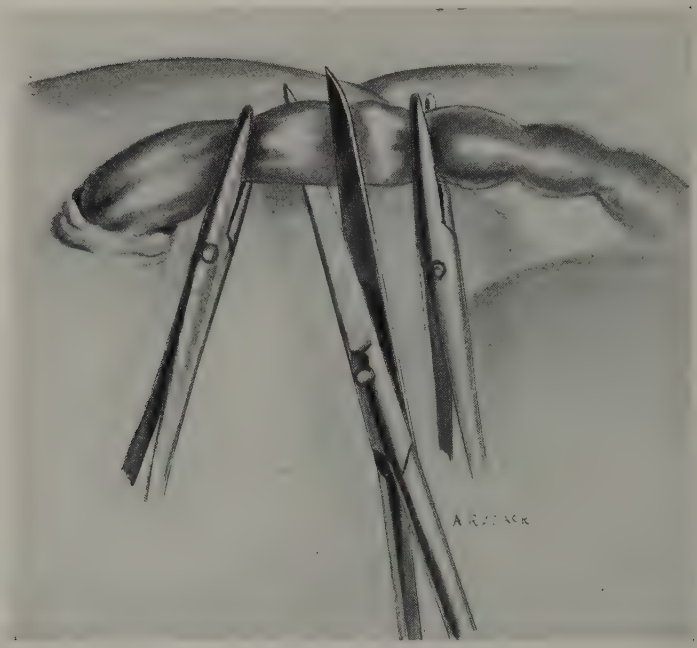

Fig. 6377.—Division of the Umbilical Cord Between Temporarily Applied Clamps – where it may be necessary to hurriedly separate child and mother.

cord divided between them (Fig. 6377). The child's end of the cord is then technically tied when the emergency is passed.

TRANSUMBILICAL INFUSION OF SALINE SOLUTION, IN THE NEWBORN

This method of revival has been successfully practised, in some of the forms of asphyxia and of shock sometimes encountered in the newborn infant.

Fig. 6378.—Infusion of the Newborn Child with Normal Saline Solution Through the Umbilical Vein; – The two umbilical arteries have been tied in the stump of the divided cord. The ligature is around the stump, with the first turn made toward its permanent tying. (For clearness of details, the cord is represented disproportionately large.)

After the cord has been divided, under control, and the two umbilical arteries tied, the cannula of the outfit is carried into the lumen of the umbilical vein, which is then tied around the neck of the tube _ by a friction knot only, the ends of which are kept under control (Fig. 6378).

About 30 c.c. of normal saline solution are first thrown in _ and, subsequently about 20 c.c. more may be added, after an interval. The cannula is then withdrawn and the friction knot tied tightly around the vein, and the second knot added. The margins of the connective sheath of the cord are then brought together by a continuous stitch of fine catgut, over the ends of the ligated vessels _ or the entire cord may receive an additional mass-ligature.

CHAPTER XCVII

OPERATIONS FOR DEFORMITIES AND DISABILITIES NOT INCLUDED IN PRECEDING CHAPTERS

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INTRODUCTORY

It is readily apparent that no sharp limits and definitions can be given as to what does and what does not constitute Deformity _ almost any congenital, acquired, or traumatic departure from average normal standard results, in the broadest sense, in deformity _ even some physiologic conditions, such as pregnancy _ to say nothing of many purely medical states _ and almost all surgical conditions, of all sorts.

The wide range of the definitions of deformity may be gleaned from the following: _ "From *de*, without, and *forma*, form; a morbid alteration in the form of a part, or organ, of an organism" (Foster's Encyclopedic Dictionary); _ "Distortion of any part, or general disfigurement of the body" (Dorland's Medical Dictionary); _ "Physical malformation or distortion; disproportion, or unnatural development of a part, or parts" (Century Dictionary).

Deformity often implies, even if the word does not signify, morbidly modified, or totally absent functionation (Disability) _ as one frequently encounters in conditions of paralysis, where, especially at first, there may be no change in form, or contour. In many instances combinations of abnormal form and function coexist _ while, in other instances, there may be departure in form alone,

without appreciable change in function _ or morbidly involved function without appreciable change in form.

The deformities of general medical conditions, usually transient in nature, are, of course, not dealt with in the present work.

The majority of the operations for the many deformities of the connective tissues, and of the special organs, will be found in the various preceding chapters of these volumes _ and their groupings, as well as the pages upon which they may be located, are given in the special chapter captions _ as well as in both the Indices of the different volumes, and in the General Index.

In the present chapter, a number of operations for correction of deformities _ not included in the preceding chapters of the work _ will be found.

Note.—This chapter has been added after the work, as a whole, had been completed _ and the several Artists had disbanded. For this reason, no special illustrations accompany these writings _ and because the great majority of the deformities and their corrective operations have been given in the chapters which precede, and are amply illustrated.

OPERATION FOR CONGENITAL TORTICOLLIS, BY DIVISION OF THE UPPER OR LOWER ASPECT OF THE STERNOMASTOID MUSCLE

Two methods of procedure are in vogue: _

Division of the Lower End of the Sternomastoid, with Overcorrection of the Deformity.—Expose the lower end of the sternomastoid by open dissection _ as any attempt to make the division subcutaneously is unwarrantable, owing to the proximity of important structures. The muscle should be divided upon a director _ after the satisfactory safeguarding of adjacent important structures. The sternal attachment is always divided _ and the clavicular attachment almost invariably requires division also. The sheath of the muscle must be completely divided, as well. The internal jugular vein has been frequently wounded. The wound is carefully closed _ and the neck is put up in overcorrection. The lower operation probably has the greater number of adherents.

Division of the Upper End of the Sternomastoid, with Overcorrection of the Deformity.—In the Tillaux-Lange technic, the upper portion of the muscle is exposed by an incision of about $1\frac{1}{2}$ inches, with its center opposite the center of the mastoid process. Dissect through the fascia and platysma muscle and expose the upper part of the sternomastoid sufficiently to pass a director beneath it, upon which it is then transversely divided _ guarding the spinal accessory nerve and external jugular vein. The overcorrection in which the head and neck are immobilized should not be exaggerated.

The overcorrected position of the head and neck is usually maintained for about six weeks.

OPERATION UPON THE SHOULDER, FOR OBSTETRIC PARALYSIS

Sever's Technic

This procedure is indicated where there is obstruction to movement, not through lack of muscular power, but through bony or muscular impediment.

Incise, in the axis of the limb, from the tip of the acromion, to the insertion of the pectoralis major, ending just below it. Divide the humeral attachment of the pectoralis major near the bicipital groove _ after safeguarding the cephalic vein _ and passing a director beneath the muscle. While abducting and rotating the arm outward, divide the tendon of the subscapularis, upon a grooved director. This will usually free the purely muscular interference.

In those cases in which the acromion process is curved downward over the

antero-external aspect of the humeral head, the acromion should be divided by motor or Gigli saw, or by chisel _ at the site of its downward curvature _ or be partly sawn and partly fractured, and removed.

The arm is immobilized at an elevation quite as high as the shoulder, in abduction and full outward rotation, and the hand in supination.

SPINAL FIXATION, BY CONTIGUOUS BONY FUSION

Hibbs' Operation

Description.—Spinal Fusion, Spinal Arthrodesis, or Spinal Fixation, as performed by Hibbs, is a technic whereby the involved region of the spinal column is stiffened and solidified by the welding, or fusing together of the more posterior bony elements of periosteum of the contiguous spinal vertebræ _ and is accomplished by the partial detachment and readjustment in new and transposed approximation of the posterior aspect of portions of the periosteal and bony parts of the spinous processes, laminæ and transverse processes _ over all of which the split periosteum and ligaments are finally sutured, tube-fashion _ and the parts allowed to solidify in their new relations, under immobilization.

Indications.—This procedure is chiefly resorted to in order to strengthen and solidify the weakened part of the spine involved in tuberculosis of the vertebræ (Pott's disease). The operation is also employed in scoliosis of the spine, for the purpose of stiffening the column in the region of the curvature.

It has been held, in some quarters, that both Hibbs' and Albee's technics of spinal fusion certainly do solidify and ankylose the posterior bony elements of the involved part of the spine and cause union between them, but that they leave freedom of movement between the vertebral bodies, and that the bodies tend to rotate as the patient grows, because they alone can move, while the posterior elements of the column are steadied by fusion _ in other words, it is held, in these quarters, that the spine is fixed posterior to its center of rotation. It may be asked, even if these reasonings were generally admitted, to an extreme degree _ which is not the case _ whether a spine stiffened and its curvature arrested somewhere, is not better than one stiffened and arrested nowhere.

Operation.—A median axial incision is made directly over the tips of the spinous processes, passing through skin, fascia, supraspinous ligaments, and periosteum _ extending somewhat above and below the immediately involved region. This incision divides the periosteum in the median line, over the spinous processes. The periosteum is then incised over both the upper and lower prominent posterior margins of the spinous processes (that is, throughout their length) _ as well as along the upper and lower borders of the laminæ _ after which, the individual sheets of periosteum are stripped back, with periosteal elevator, to the bases of their respective transverse processes. Bleeding is controlled, during this stage, by gauze-packing. The lateral articular processes at the bases of the transverse processes are exposed and curetted _ for the purpose of contributing arthrodesis to the ankylosis of the periosteo-osseous parts. The spinous processes are then partially fractured, transversely, near their bases, by bone-pliers, or by chisel _ after which, the partially freed but still connected spinal tips are downwardly transposed in such manner that the partly severed base of each remains in contact with its own base, and its tip with the site of the partly severed base next below. From the posterior surfaces and borders of the laminæ which have been freed of periosteum earlier in the operation, small platelets of bone are partially detached by chisel, but are left hinged at their opposite ends, and are then broken back-

ward and so disposed as to overlap the raw bony surface left upon the lamina next below by turning down a platelet of its outer surface, thus bridging the space between them. Finally, the temporarily, outwardly displaced small sheets of periosteum, together with the medially divided supraspinous ligaments, are brought together about the rearranged bony fragments, and sutured tube-like, over them, by buried chromic catgut. The fascia and skin are then united by interrupted or continuous suturing — and a dressing applied. A steel brace immobilizes the spine — without pressure over the wound.

The patient remains in bed for from eight to ten weeks — sits up for four weeks — and begins walking at the end of twelve weeks. The brace is worn continuously from the beginning until a month after walking is resumed — after which, it is discarded for a part of each day — and then gradually entirely discarded.

Comments.—The lateral articular processes are practically destroyed, in order to aid in forming bony ankylosis.

Sometimes the platelets of bone removed from the posterior aspect of the laminæ are in two pieces — being removed from adjacent edges of each lamina, and consisting of half its thickness and half its width.

The margins of the deeper wound may be brought together by two tiers of buried chromic gut sutures — and the skin, with silk, chromic gut, or silkworm gut.

SPINAL FIXATION, BY FREE BONE TRANSPLANTATION

Albee's Operation

Description.—In this procedure, the involved, weakened region of the spine is stiffened and solidified by a technic which also amounts to a spinal fusion, as in Hibbs' method (v. Vol. II, p. 354) — but which is accomplished, in the present case, by implanting a bone-graft, taken from the tibia, between the medially split spinous processes of the portion of the spinal column involved.

The field of application for this method of procedure, is tuberculosis of the spine.

Position.—The patient lies prone, with his head over the end of the table and supported by a separate stand.

Incision.—Is usually from 6 to 8 inches in length — beginning safely above the involved region of the spine, over the spinous processes — swerving to one side of the median line, in curved fashion, opposite the site of disease — and coming back into the median line below the opposite limit of the lesion. A semilunar flap exposure is thus secured — its margin lying away from the field of infection.

Exposing the Vertebral Spines.—The flap, above outlined, is raised and retracted to the side of its base — hemorrhage being usually controllable by gauze pressure — and, where necessary, is controlled by ligature. The supraspinous and interspinous ligaments are divided in the median line, over and between the spinous processes — leaving, undisturbed, all other muscular and ligamentous attachments to the spinous processes and other parts of the vertebral column.

Using the Albee special osteotome (thin and sharp, and of $1\frac{1}{2}$ inch width), the spinous processes are split medially, almost to the neural arches. The same half of all the split spinous processes are then outwardly fractured at their bases — and are displaced to the same side sufficiently far to form a trough, or gulley commensurate with the special bone-graft to be received. The opposite, intact halves of the split spines are carefully preserved unbroken and otherwise untouched. The gutter thus formed, will be represented, on the

median side, by the unbroken halves of the spine and the bisected but attached supraspinous and interspinous ligaments, with the attachments of the soft parts unaltered – and, on the outer side, by the broken-back halves of the spines and their attached bisected supraspinous and interspinous ligaments and other soft parts. The gutter-bed is packed with gauze wrung out in hot saline, while awaiting the graft.

The Tibial Bone-graft.—The length and width of the required bone-graft is determined by caliper measurement of the spinal gutter-bed – and its shape (that is, its angle), by means of a flexible probe, bent to correspond with the spinal kyphosis, as verified by test in the spinal-trough – these measurements serving as the pattern to be applied to the tibia furnishing the graft. As the patient's position is prone, the leg is acutely flexed, to expose the tibial aspect. The bone-graft is raised through an incision along the antero-internal aspect of the tibia, so outlined that the sutures will not fall over the bone-cavity in the tibia. The soft parts are dissected from the periosteum, which is left intact – and are retracted from a sufficiently large area to provide the graft in the special case.

Albee writes – "The size and thickness of the graft required depend upon the segment of the spine to be immobilized and the amount of strain required of the graft. In general, it should include the total thickness of the tibial cortex (periosteum, endosteum, and marrow), and its width should be three to four times this amount. Using the molded probe as a pattern rod, the required graft is outlined by incising the periosteum with a scalpel. The lower three-fourths of the antero-internal surface of the tibia is selected on account of its strong, dense cortex. If the graft is to be straight, it is best removed from the crest, wide enough to encroach upon the antero-internal surface, so as to furnish the width required. If it is to be molded for a moderate kyphosis, the central or fulcrum portion of the curved graft includes the crest of the tibia, and from this portion each end is cut obliquely upward and downward on the antero-internal surface of the bone. The advantage of this graft lies in the dense thick cortical bone which forms its fulcrum portion, and which constitutes the strength of a lever (graft). Sharply angular kyphoses, and those of short duration, particularly in children, are amenable to varying degrees of correction. In molding the graft, its pattern should be the shape of the gutter-bed *after* correction has been applied by manual pressure on either side over the lateral masses when the probe is then bent into the clefts of the split spinous processes.

"To obtain the straight graft, the tibial cortex is cut through to the marrow cavity with the motor circular saw, following the periosteal outlines of the pattern; this includes a saw-cut just to the outer side of the tibial crest and at a right angle to the one previously made on the antero-internal surface. This cut must be made the whole length of the graft, is a straight one; and if a molded one, only to include the middle or fulcral portion. At either end, beyond this central or crest portion, the graft overlies the marrow cavity and the saw-cuts, therefore, need only be made on the antero-internal surface to free the graft."

The saw-outlined graft is now freed at both ends by section made with a very small motor saw, after which, it is loosened and pried from its bed by a very thin chisel, or osteotome.

Contracting the Graft.—Inlaying the graft into its spinal bed is accomplished, as to general principles, as in transposing grafts elsewhere – modified by the special conditions of this particular site. The bone-grafts are always transferred directly from their furnishing sites, to their new beds – and are held, in this transferal, in bone-clamps, without finger touch. While the

Surgeon is molding and implanting the graft, an Assistant closes the soft parts over the tibial incision, by No. 1 plain catgut.

In transferring a straight bone-graft, it is simply interposed between the halves of the split spines and their ligaments, and held in position by kangaroo-tendon sutures carried through one-half of the split supraspinous ligament, on one side – up over the bone-graft in the center – and out through the other half of the split supraspinous ligament. When these sutures are tightened and tied, the split halves of the supraspinous ligament bury in the bone-graft beneath them. As many such sutures are applied as necessary for good contacting – and they are placed deeply enough to hold the graft in firm, deep contact. It is necessary that the graft should be long enough to include two healthy spines above and two healthy spines below the site of disease. The median suture is placed and tied first, to steady the graft – and the others are ½ inch apart. The sharp corners of the bone-graft are cut off with bone rongeurs – and the fragments thus removed are packed around and under the graft-ends before these are buried by sutures. The ends of the graft are thus both roughened for better contact, and the bone-fragments removed from their ends supply additional foci for bone growth.

In those cases where the bone-graft has been cut in a curved pattern, it is placed *on edge* in the spinal gutter, so as to fit the kyphotic bed – and so that its marrow surface rests in contact with the side of the gutter bounded by the unfractured halves of the spinous processes – and its periosteal surface in contact with the fractured halves of the spines. The endosteal marrow surface, the more active osteogenetically, is thereby brought into touch with the more active unfractured halves of the split spines. The curved bone-graft is sutured into position in the same manner as is the straight graft.

In using the bent-in bone-graft, the method of securing and forming it are described by Albee as follows: – "If a straight graft with transverse saw-cuts (made on its marrow surface two-thirds to three-fourths through its thickness) is to be bent, it should be obtained from the lower three-fourths of the antero-internal surface of the tibia, where the cortex is thick and includes the crest, or not, at the discretion of the operator. If the graft does not include the crest, the twin-saw hastens its removal and insures its uniform width throughout. If it includes the crest, cuts at right angles to each other, on each side of the crest are necessary. The graft in the latter case includes two periosteal surfaces, and is therefore more active osteogenetically, and stronger mechanically. It is again emphasized that *every graft should include all bone elements, namely, periosteum, compact bone, endosteum, and marrow substance.* This is the Author's bent-in graft, and, as the saw-cuts naturally weaken it, the molded graft previously described, should always be used instead, when possible." In inlaying the bent-in graft in the spinal gutter, its medullary aspect, upon which the saw-cuts are, is placed downward (toward the vertebral bodies) – its periosteal aspect upward (posteriorly) – and its lateral surfaces in contact with the sides of the spinal gutter. The bent-in graft is sutured as in the other forms of grafting, except that one end and then the middle are first sutured – after which the opposite half is gradually sutured from its center, outward, while carefully bending the graft. It is well to reinforce this form of grafting, whether its center breaks or not, with thin strips of cortical bone, cut from the tibia, and placed along its sides.

Wound-closure and After-treatment.—The skin incision is closed in the ordinary manner, and protected by sterile gauze. Gauze pads are placed on each side of the incision, to prevent pressure upon the wound and upon the apex of the kyphosis. Patients, following operation, lie upon their sides – and are kept so – during the postoperative recumbent period – after which,

they are kept recumbent upon their back in a fracture-bed for five weeks, in the case of adults, and six weeks, for children. In marked kyphosis, the patient is kept in the lateral oblique position, and thick dorsal pads are so applied as to avoid pressure upon the involved site.

Some form of external support is employed when a patient must be moved from bed, earlier than usual — or when a bone-graft is weakened by the bending of the transversely cut graft to mold it to a case of marked kyphosis.

FIXATION OF DISEASED OR MOVABLE SACRO-ILIAC JOINT, BY BRIDGE BONE-GRAFT FROM SACRUM TO POSTERIOR WING OF ILIUM

Albee's Operation

Description.—The condition for which this procedure is most frequently employed is usually tuberculosis of the sacro-iliac joint — and is carried out for the purpose of immobilizing the articular aspects of that joint. It may be employed in other forms of relaxed sacro-iliac joint.

Operation.—The spinal and tibial fields of operation are prepared — and the patient is placed in a prone position.

The posterior wing of the ilium and the upper contiguous aspect of the sacrum are exposed by a curved incision, so planned that the subsequent skin-suturing will not bring a scar directly overlying the site of grafting.

This somewhat difficult-to-understand technic is here described in the words of its author: — "The first spinous process of the sacrum is split *en masse* with its enveloping ligaments and soft tissues, the cleft being made not vertically, but at right angles to the long axis of the spine. The upper half of the split process is left attached to the sacrum and unbroken; the lower half is fractured at its base and displaced downward. On account of its small size, the first sacral spinous process may be fragmented by repeated attempts to split it in equal halves, but this interferes in no way with the ultimate result if the fragments are left attached to the enveloping ligaments.

The periosteum and the posterior surface of the sacrum where the *graft* is to be contacted is split in line with the cleft in the spinous process and peeled downward with the sharp periosteal elevator. The underlying bone is then scarified over a considerable area for contact with the graft.

The mesial surface of the posterior wing of the ilium projecting beyond (toward midline) the sacro-iliac joint is developed and a cleft is made by driving a $\frac{1}{2}$-inch osteotome into it in a plane parallel with the prepared posterior sacral surface for the reception of the distal end of the graft. In making this cleft the handle of the osteotome is pressed down as tightly as possible against the posterior surface of the sacrum. The distal end of the graft is beveled in such a way that, on being forced into its bed in the ilium, its proximal (sacral) end is tightly coapted to the posterior surface of the sacrum." The operation field is now packed with hot saline compresses, awaiting the tibial graft.

The tibial bone-graft is secured while the leg is acutely flexed (owing to the patient's position), and the graft is raised through a curved flap incision, whose suturing will not fall over the site from which it is taken. The bone-graft, from the antero-internal aspect of the tibia, is secured, of a width of $1\frac{1}{2}$ inches, or more — with its distal end beveled upon its periosteal aspect (which is to lie dorsad), to enable it to be tightly driven into the cleft in the ilium by means of Albee's bone-peg set. An excess of marrow substance is left upon the graft — and fragmented bone is scattered about the junction of the graft with the ilium and sacrum.

The ligaments and soft parts are drawn over the graft with medium kangaroo-tendon _ and the wound is closed with No. 1 plain catgut.

The patient remains recumbent in bed for six weeks, or more.

OPERATION FOR TUBERCULOSIS OF THE SACRO-ILIAC JOINT

Piqué's Technic

Description.—Through this exposure, the posterior aspect of the joint is approached _ and the removal of diseased articular bone, drainage and solidification may be provided for. Tubercular osteomyelitis of the sacro-iliac joint is the most fatal of all joint affections.

Operation.—Approach is gained by a curved incision carried over the posterior third of the iliac crest _ and on down the border of the sacrum, as far as the level of the postero-external sacral tubercle.

Through this incision the overlying soft parts, including the periosteum, are raised and reflexed downward and forward from the posterior aspect of the ilium. The thickness of the iliac bone adjacent to the sacro-iliac joint, is then divided in a vertical direction, with an osteotome, from its crest down to the upper and inner corner of the great sacrosciatic notch. If a less degree of exposure suffice, the vertical incision is made shorter, and its lower end is connected with the posterior border of the iliac bone by a transverse incision coming off from the vertical incision before the latter has reached the upper border of the great sacrosciatic notch.

The soft parts attached to the divided part of the ilium (its smaller, posterior part) are severed and the detached fragment levered out _ further separating whatever other ligamentous structures hold the part. Next, the iliac aspect of the sacro-iliac joint is removed, as far as may be indicated by the local conditions _ thoroughly exposing both the iliac and sacral aspects of the joint. All diseased structure is removed by chisel and gouge, or curet, from the common joint surfaces, and especially from the sacral _ exposing the field to view as largely as indicated, and possible. During these manipulations, the important nerve trunks in nearby relationship are carefully preserved from harm.

In closure, the wound is packed with gauze _ and the wound is closed by suture, up to the exit of the gauze _ and the part immobilized.

OPERATION FOR TRIGGER-FINGER

Jerk-finger, snap-finger, or spring-finger, as variously termed, is caused by some abnormal condition of the flexor tendon, or its sheath.

If fixation and pressure do not relieve, operation is indicated.

Locate the exact site where the jerk occurs. Expose the flexor tendon in this region of obstruction _ and if the tendon is too thick, shave off a portion _ and if the sheath is too tight, enlarge it.

If an obstructing nodule is found, excise it.

EXCISION OF THE RADIOHUMERAL BURSA, FOR RADIOHUMERAL BURSITIS

It occasionally happens, in violent or continuous action of the forearm _ as in tennis playing, hammer striking, and the like, a condition, commonly called "Tennis Elbow," or epicondylitis, as sometimes designated, is developed _ and is caused by a bursitis of the small bursa lying between the radiohumeral joint and the conjoined tendon of the extensor muscles of the forearm. The object of the operation in question is the removal of this bursa, lying under

the conjoined tendon of the forearm extensors and the tip of the epicondyle – whether other adjacent structures, as suggested by the title, epicondylitis, be involved or not.

Make an oblique incision, from the external humeral condyle, extending downward in the axis of the radius, and lying over the radial head – carrying the dissection through the fascia – splitting the fibers of the conjoined tendon of the extensor muscles, in their cleavage line, and opening up the bed of the radiohumeral bursa – which is excised.

EXCISION OF THE OLECRANON BURSA, FOR CHRONIC BURSITIS

In Miner's Elbow, or in similar conditions caused by pressure upon the bursa – where less radical measures have failed to secure relief – it is sometimes indicated to excise the entire bursa.

This is a simple procedure – and consists in making an axial incision over the olecranon prominence, into the connective-tissue plane – and there dissecting the bursa from its bed – followed, in non-infected cases, by closure of the wound.

OPERATION FOR AVULSION OF THE TENDON OF THE SUPRASPINATUS MUSCLE, ALONG WITH PART OF ITS ATTACHMENT TO THE GREATER HUMERAL TUBEROSITY

The tendon of the supraspinatus is sometimes torn away, together with part of its bony insertion into the greater tuberosity of the humerus – as a result of severe injury, especially in falls.

In operating, expose the site of injury by a straight incision, crossing the shoulder from before backward, and lying directly over the acromioclavicular joint – beginning in front of the acromioclavicular joint, and extending backward beyond the scapular spine. Divide the acromioclavicular ligaments – and, by means of a carrier, conduct a Gigli-saw beneath the acromion, at its attachment to the spine of the scapula and divide it. This section will enable the acromion process, together with the attached deltoid muscle to be displaced outward and downward – thus exposing the greater tuberosity of the humerus. The detached portion of bone serving as the insertion of the supraspinatus tendon, is reattached to its normal site upon the tuberosity by means of pegging, or nailing – together, if the nature of the case admits, of a few catgut sutures of adjacent fibrous tissue. The separated acromion as well as the divided acromioclavicular joint may be repaired by suture, as indicated – but, in any event, do not show much tendency to displacement, if the arm be immobilized in abduction.

OPERATION FOR HABITUAL, OR RECURRENT DISLOCATION OF THE SHOULDER

Clairmont's Technic

Use is here made of a partially separated tongue-strip of the deltoid muscle, which is displaced, and brought through the joint, and then so anchored, in its new position, that it plays the rôle of a tightened sling carried partly around the joint capsule.

Make an anterior incision about 5 inches long, beginning at the coracoid process, and extend it downward, parallel with and to the outer side of the anterior margin of the deltoid. Through this incision, the fibers of the deltoid are separated, in corresponding line – and the quadrilateral space, bounded by the humerus and long head of the biceps, laterally, and between the teres

minor and teres major, above and below, is carefully dissected out, to make space for the passage of the muscular strip of the deltoid. In order to secure some additional room in this quadrangular space, the upper third of the teres major muscle is usually transversely incised.

The posterior incision is made downward from the acromiospinous attachment of the deltoid, to the free aspect of the posterior border of the deltoid, and rounding out across the posterior border of the deltoid, so that a tongue-like strip, or flap of deltoid, with a portion of its tendon, of sufficient width for the purpose, will be formed. This deltoid flap-strip is now carefully freed upward – especially maintaining the integrity of its nerve supply – which is readily safeguarded, as, in the upward turning of the flap, the nerve is plainly seen passing into the muscle from below.

Pass the broad blades of a pair of non-traumatizing forceps through the enlarged quadrangular space from in front – seize the free end of the deltoid flap, in the posterior wound – and draw it from behind, forward, through the artificially made tunnel – and suture its outer and inner borders into the corresponding outer and inner borders of the anteriorly split deltoid (into the borders of the deltoid made by splitting its anterior aspect, at the beginning of the operation).

In the performance of this operation, it is necessary, for its technical success, to observe several points: – (*a*) The space for the bringing through of the mobilized tongue of deltoid, must be made amply large, by incising the upper border of the teres major, and by dissection of the area, to enable the deltoid flap to be drawn through without disorganization of this flap, as one sometimes witnesses. (*b*) The tongue-flap must be amply long to make the excursion, without tension – and, for this reason, it is well to insure full length by including some portion of periosteum, raised at the site of its insertion. (*c*) The tongue-flap of deltoid should be substantial enough to accomplish its object – and should, therefore, consist of about one-fourth of the width of the deltoid. The deltoid strip both serves as a sling, and contracts when the arm is abducted, thus serving as a safeguard against displacement.

OPERATION FOR HALLUX VALGUS

In hallux valgus there is marked deformity of the first metatarsophalangeal joint – the great toe being turned abruptly outward, sometimes underlying the second toe.

The object of procedure, for its relief, is to excise the prominent inner condyle of the head of the first metatarsal, together with any bony exostoses which may be present.

If the condition be due to a marked bursitis, due, in turn, to deformity, it is indicated to excise a wedge-shaped piece of the head and neck of the metatarsal – the apex of the wedge lying toward the second toe. If the condition be due to hypertrophic arthritis, excision of the metartasophalangeal joint is indicated.

The site of involvement should be exposed by a flap-incision, with its hinge lying below the prominence of the deformity – and of skin only. An underlying flap of connective tissue, and of the bursa, if any, with its pedicle lying forward, is raised – which constitutes the interposition flap to be placed between the bones, should it be indicated.

The section of the internal condyle of the head of the metatarsal is made by osteotome, or, better, by motor-saw.

It is better to leave the sesamoid bones *in situ*.

The wound is sutured – and the toe put up in a hallux valgus splint.

OPERATION FOR HAMMER-TOE, BY CUNEIFORM EXCISION OF FIRST INTERPHALANGEAL JOINT

In hammer-toe, the knuckle of the proximal interphalangeal joint is dorsiflexed, and presses upon the roof of the shoe _ and the tip of the toe is bent downward, and presses the sole.

Expose the joint by an elliptic incision, through which the overlying corn will also be removed. A wedge-shaped piece of the articular surfaces of both phalanges, with upward base, is excised, preferably by saw-section _ after throwing their articular ends prominently forward, in disarticulating the joint. The sawn bone ends are then approximated, in normal axis, with the intention of securing ankylosis in that position. The flexor tendon is divided _ and the toe splinted, outstretched.

After union, it is well that the toe remain lightly splinted, for several weeks, worn within the shoe.

OPERATION FOR CLAW-FOOT

In claw-foot, or pes cavus, several grades are noted: _ The first degree is found in children, where there is a noticeable grade of increase in the longitudinal arch; _ In the second degree, both the plantar fascia and the tendo achillis are much more shortened, and the deformity is very evident; _ In the third degree, the deformity is the same, but is much more pronounced; _ In the fourth degree, the deformity is so severe and the foot is of so little functional use, that amputation is often sought.

Operation in the Third Degree of Claw-foot _ quoting from Albee: _ "It is necessary to do a twofold operation in cases so severe. The plantar fascia is severed at its convergence into the os calcis, and the foot is wrenched to flatten the arch. The deformity of cavus is so severe in this stage that it is necessary to shorten the metatarsal bones by removing $\frac{1}{2}$ to 1 inch of bone from the shafts of the first, second, third, and fourth. It is usually best to preserve the fifth metatarsal for its internal splint action. In most cases it will be found necessary to divide both the extensor and flexor tendons. The tendo achillis is preserved in order to get a better leverage control in holding the foot corrected of its cavus. At the second operation, some three or four weeks later, the tendo achillis is divided and the foot is wrenched into a position at right angles to the leg. After operations, shoes with low heels should always be worn."

OPERATIONS FOR CLUB-FOOT

Talipes is a conventionally used word _ signifying, by use, though not etymologically, club-foot. Derivatively, talipes comes from talus, ankle _ and pes, foot. Not only is the designation talipes meaningless, but some of its qualifying words are confusing; for instance, talipes valgus is used of an outwardly turned foot _ while genu valgum is applied to an inwardly turned knee.

Varieties of Club-foot: _

Talipes equinus _ plantar flexion.
Talipes calcaneus _ dorsiflexion.
Talipes varus _ inversion and adduction.
Talipes valgus _ eversion and adduction.
Talipes equinovarus _ extension and eversion.
Talipes calcaneovalgus _ flexion and eversion.
Talipes equinovalgus _ extension and eversion.
Talipes calcaneovarus, with cavus, flexion, and inversion.
Pes cavus _ increased convexity of longitudinal arch.
Pes planus _ flattened longitudinal arch.

The percentage occurrence of the different forms of club-foot is estimated to be about as follows: – Talipes equinovarus, 77 per cent. – Talipes valgus, 5 per cent. – and then, in order, Talipes varus, calcaneovalgus, equinus, calcaneus, and equinovalgus.

The general features upon which is based the operative treatment of marked cases of talipes equinovarus are – preferably, those operative measures tending to remove the resistance of the internal ligament lateral of the ankle-joint – or by bone-wedge excising operation.

Ober's Operation for Congenital Equinovarus.—Make a fish-hook incision, with forward bend around the inner malleolus – beginning $1\frac{1}{2}$ inch above the malleolus, midway between the posterior border of the tibia and the tendo achillis – passing about $1\frac{1}{2}$ inch under the inner malleolus, and then swinging forward over the depression corresponding with the subluxated scaphoid. Deepen the incision through the skin and fascia – free this flap and displace it upward – thereby exposing the deep fascia, annular and deltoid (external lateral) ligaments. Through these latter structures, make a semicircular incision down to the bone, circumventing the internal malleolus – carefully preserving the posterior tibial tendon. Dissect this ligamentous flap from the bone in a downward direction, including both layers of the deltoid ligament – thereby securing good exposure of the tibiotarsal joint.

Continue the curved incision downward, dividing the superior calcaneoscaphoid ligament. Divide longitudinally, the part of the internal lateral and inferior calcaneoscaphoid ligaments which have their attachments, respectively, to the posterior and anterior borders of the sustentaculum tali – carrying the incision to the bone. These ligaments are now "boned" from the inferior surface of the os calcis, with an osteotome or a blunt dissector, along with their periosteum – and down to the inner surface of the os calcis. While the posterior tibial tendon need not usually be cut, the tendo achillis must often be cut in older children. If cavus be also present, the plantar fascia is divided. The foot is then taken by forefoot and heel and brought into overcorrected position. For fear of damaging the plantar artery, this overcorrection should only be moderate for a few days – and then this increased.

Elmslie's Operation for Congenital Equinovarus.—Make an axial incision over the inner malleolus and prolong it forward over the inner aspect of the foot – expose the posterior tibial tendon and displace it – and sever the anterior two-thirds of the internal lateral ligament from the malleolus. Cut away the thickened mass of fibrocartilaginous astragloscaphoid capsule, lying in front of the malleolus – thus exposing the head of the astragalus. Clear the tuberosity of the scaphoid upon its posterior and inferior aspects. The sustentaculum tali is cleared – the mass of fibrocartilaginous tissue retaining its attachment only to the posterior tibial tendon. Divide the tendon of the posterior tibial – removing that part of the calcaneoscaphoid capsule represented by the anterior and median fibers of the deltoid ligament blending with the inferior and internal calcaneoscaphoid ligament.

Make a limited incision antero-inferior to the tip of the external malleolus – and through it, carry an osteotone, and transversely divide the os calcis $\frac{1}{2}$ inch posterior to its anterior surface – bringing the osteotome out on the inner aspect of the foot, in front of the sustentaculum tali.

The anterior portion of the foot is now abducted and elevated – the scaphoid gliding upon the astragalus – and the cuboid carrying with it the anterior part of the os calcis. The neck of the astragalus can be divided transversely by osteotome, if it be desired to give greater obliquity to it.

The foot is put up, overcorrected, in plaster of Paris.

Bone-wedge Operation for Club-foot.—The method of performing this

type of operation preferred by Jones and Lovett, is as follows: — Make an incision along the external aspect of the foot, passing below the outer malleolus and extending to the anterior aspect of the cuboid. Expose the peronei tendons and displace to one side. Excise a wedge of bone from the os calcis with its base outward — "made just below and behind the calcaneo-astragalod joint." Excise a transverse wedge, with outward base, from the cuboid. In cases in which it is indicated, "the tenotome is passed transversely through the scaphoid" — using the same incision of entry — or through a second, small incision upon the inner aspect of the foot.

A curved wedge may be excised from the astragalus, with upward and outward base, if it be necessary. The foot is now capable of dorsiflexion and eversion. The deltoid ligament is divided, in conjunction with the rest of the technic.

In the above procedure, it is stressed that the base of the wedge is placed posterior to the astragaloscaphoid and cuboid, and the astragalocalcaneal articulation — and does not, therefore, involve the function of those joints. If the astragalus be displaced forward to any extent, division of the external malleolus will aid its reduction.

The foot is overcorrected and put up in plaster.

OPERATION FOR ANTERIOR BOW-LEG

Anterior bow-leg may be treated by osteoclasis, linear osteotomy, or by cuneiform osteotomy — of which linear osteotomy is the best, in moderate curvature — and cuneiform osteotomy, in more angular deformities.

The methods of performing these technics are the same as in applying the corresponding operative procedures to cases of genu varum (v. Vol. II, pp. 289–296).

OPERATION FOR GENU VARUM (BOW-LEG), BY OSTEOTOMY

Linear Osteotomy, with an Osteotome.—Where a curvature rather than an angularity exists, a linear osteotomy, with an osteotome, is usually performed. An osteotome of $\frac{1}{2}$-inch width is serviceable, in average cases. An incision through the soft parts, parallel with, and down to the tibia is generally made — and is preferable to the crude method of driving a semi-sharp osteotome down upon the bone — and, upon the knife with which this incision is made, the osteotome is carried to the bone — and then turned at a right angle to its axis, before beginning the section.

The technical method of conducting this type of osteotomy, as to its mechanical performance, is described in Vol. II, p. 290.

The fibula may be similarly exposed and sectioned — or it may be manually bent, until partially, or completely fractured and brought into line.

The limb is immobilized, in overcorrection, by a plaster-of-Paris cast, from the toes, to the middle of the thigh. This dressing is maintained for from six to eight weeks.

Linear Osteotomy with a Saw.—The bone sections may be made with an Adams saw — in the same type of cases as those in which linear osteotomy with an osteotome is performed.

The technic of linear osteotomy with a saw, in general, is described in Vol. II, p. 292. Also see Fig. 1248, Vol. II.

Cuneiform, or Wedge-shaped, Osteotomy with a Chisel.—Is more particularly indicated where the deformity of the bone, or bones, is more angular than simply curved — and where better alignment is secured by the removal of some of the bone substance. The base of the wedge of bone removed is directed toward the convexity of the angularity — and the width of the base

of the wedge is determined, in advance of operation, by getting a paper pattern of the involved leg, while lying upon its side — from which pattern such a wedge is removed, by scissors, as will enable the paper limb to be straightened — and a corresponding wedge is removed from the actual bone.

The method of performing cuneiform osteotomy, in general, is described in Vol. II, p. 289.

OPERATION FOR GENU VARUM (BOW-LEG), BY OSTEOCLASIS

This method, while endorsed by some Surgeons, is condemned by the majority — as being, as osteoclasis is generally, crude and unsurgical.

In genu varum, the outward curvature involves either the tibia, or the entire leg.

Manual Osteoclasis.—Is sometimes performed in the case of weaker limbs — and even in more resistant ones, where the Surgeon possesses unusual strength. The leg is so placed over a padded Lorenz wedge, that the site of maximum convexity of the deformity rests upon the apex of the wedge. The Surgeon grasps the limb on either side of the wedge, and brings to bear sufficient downward pressure to cause the tibia, or tibia and fibula to yield — regulating the force to produce as little unnecessary traumatism of the adjacent parts as possible. The limb, including the knee and ankle, is then mobilized in plaster — being careful to correct the inward rotation of the tibia, in putting up the limb.

Instrumental Osteoclasis.—The instrument here employed is some form of the osteoclast — and the method of procedure is even cruder than that of manual osteoclasis.

Counterpressure is exercised by the two outer arms, which are usually from 3½ to 5 inches apart, and press upon the concave side of the limb — and the midarm is screwed down upon the site of maximum convexity — and is twisted home until the bone, or bones of the leg break — the limb, as a whole, being steadied on either side of the outer limbs of the osteoclast by an Assistant. The plunger is usually screwed home quickly — and released quickly. The limb is put up in plaster of Paris, in overcorrection.

Compound fracture often occurs during osteoclasis, especially in instrumental osteoclasis.

OPERATION FOR AVULSION OF THE TIBIAL TUBERCLE

The knee-joint is opened by one of the methods described for its exposure (Vol. II, pp. 392–395).

The separated spine is brought to its normal site, and an attempt is made to hold it in position by suturing its overlying mucofibrous tissue to the corresponding tissue in its immediate vicinity. If this fail, an effort is made to nail, or peg it in position.

REPAIR OF RUPTURE OF THE QUADRICEPS EXTENSOR AND LIGAMENTUM PATELLÆ

Expose the site of rupture by an axial incision, with its center lying directly over it — evacuate all blood-clots which may be present — or ligate any vessels which may be still bleeding.

One of the various methods of bringing together the lacerated ends of the musculotendinous structures is then carried out — such as suggested under Myorrhaphy (Vol. II, p. 423), or under Tenorrhaphy (Vol. II, p. 434), with chromic catgut, or kangaroo-tendon.

The muscle-sheath is closed over the sutured muscle — and the superficial wound repaired.

OPERATION FOR SLIPPING PATELLA

GOLDTHWAIT

The patella may be displaced upward, outward, or inward — but most frequently, outward. The traumatic form of slipping patella is generally associated with some degree of knock-knee — and usually occurs in young girls or women.

Operation.—In Goldthwait's operation, the patella is rendered less apt to slip from its position by splitting the ligamentum patella and transplanting one of the split halves into a new position.

Make a longitudinally curved incision, of from 4 to 5 inches, with inward convexity, from the lower end of the patella, to about 1 inch below the tibial tubercle. Expose the patellar tendon and divide it into two lateral halves, by median splitting. Divide, transversely, the insertion of the outer split half of tendon at its attachment to the tubercle of the tibia — and pass it under the inner half of the still attached tendon and anchor it to the periosteum and the aponeurosis of the sartorius tendon upon the inner aspect of the front of the tibia.

Sometimes it is indicated to shorten the transplanted half-tendon, before anchoring it — and to hold it in position by boring a hole in the tibia, in which it can be held by a peg.

Other Operations.—Tubby pleats the tendinous and muscular portions of the extensor cruris.

Albee reconstructs the flattened external femoral condyle — in the direction of elevating its outer aspect above the level of the internal condyle, to prevent the outward displacement of the patella — and holds it in its new position by means of a doweled bone-peg.

OPERATION FOR THE RECONSTRUCTION OF THE LATERAL LIGAMENTS OF THE KNEE-JOINT

EDWARDS

The lateral ligaments of the knee-joint may be subjected to various grades of traumatism, from over-straining, to rupture — damage occuring more frequently to the internal lateral ligament than to the external lateral ligament.

Edwards' method of repairing these ligaments is as follows: —

(*a*) **Repair of the External Lateral Ligament of the Knee.**—Expose the fascia lata, outer femoral condyle, biceps and head of the fibula, by an outer axial incision over these structures. Incise a right-angled flap of the fascia lata, 3 inches in length. This flap has its pedicle toward the joint, and throughout the rest of its extent is folded upon itself and sutured, so as to form a ribbon-like length.

Separate the fibrous tissues over the outer femoral condyle in the site usually occupied by the external lateral ligament — retract the margins of these incised parts — and gouge out a trough in the axis of the femoral condyle, $\frac{1}{4}$ inch deep and $\frac{1}{2}$ inch long. Prepare a similar trough in the axis of the fibular head.

Cut and pull forward the biceps tendon flap, inserting it in the bony groove thus made, and fasten it down with a small staple — and suture the adjacent fascial tissue over it. Then turn down the previously prepared ribbon-like flap of fascia lata, and similarly anchor it with a staple, into the fibular head — both staples being driven home while the parts are under tension. Finally, the deep fascia and skin are sutured over the site of operation.

(*b*) **Repair of the Internal Lateral Ligament of the Knee.**—Make an axial incision over the inner aspect of the knee-joint, with its center over the

inner femoral condyle _ the incision being sufficiently long to expose the sartorius muscle from its tendon of insertion, up to the lower part of the fleshy belly of the muscle. Separate the sartorius from the femoral condyle, and expose the tendons of the gracilis and semitendinosus muscles, mobilizing and drawing them forward.

Divide the tendons of the gracilis and semitendinosus on a level with the inner condyle of the femur _ free them from their attachments _ and clamp their proximal ends.

Gouge, or chisel a groove upon the inner (medial) aspect of the inner femoral condyle, in the position of the inner lateral ligament _ in the same manner as was done upon the external condyle.

Suture together the cut ends of the tendons of the gracilis and semitendinosus _ which, after their detachment from the tibia, should be pulled into the long axis of the thigh. The proximal ends of the distal portions of these sutured-together gracilis and semitendinosus tendons are then placed in the prepared bony trough in the femoral condyle _ and the adjacent fibrous tissue is placed over them _ all being held down by a staple.

Finally, suture the cut ends of the proximal portions of the gracilis and semitendinosus to the lateral aspect of the sartorius _ thereby preserving their contribution of contractility.

In conclusion, suture the deep fascia to the sartorius, while the muscle is being held backward, so that the axis of traction of the attached gracilis and semitendinosus will be maintained.

Suture the superficial fascia and skin _ and apply a plaster-of-Paris cast from the middle of the leg to the middle of the thigh. After about two weeks, remove the dressing _ and begin massage two weeks still later.

EXPOSURE OF KNEE-JOINT FOR DISABILITIES, OR INTERNAL DERANGEMENT OF ITS STRUCTURES

By Median Splitting of Patella and Quadriceps Extensor Tendon

Description.—These disabilities, or derangements usually consist of one of the following conditions alone, or of several combined: _ displacement, or rupture of the semilunar cartilages (usually the internal) _ rupture of the crucial ligaments (more frequently the anterior), with or without fracture of the tibial spine _ avulsion of the tibial spine alone _ loose bodies within the joint _ affections of the synovial fringes _ lipomata herniating into the joint _ and osteomata.

Methods of Exposing the Knee-joint.—Extensive involvements, or uncertain involvements, are best exposed through a temporary median division of the anteriorly overlying joint structures, superficial tissues, patella, quadriceps extensor tendon and ligamentum patellæ, as here described. Where the intra-articular involvement is distinctly unilateral, a sufficient exposure may often be secured through a lateral axial, or oblique incision, lying to the inner or outer margin of the patella, on the involved side _ as described upon p. 932.

Operation.—(*a*) Superficial Part of Approach by Median Incision of Overlying Skin and Fascial Structures: _ Sir Robert Jones, who introduced the technic of splitting the patella, bent the knee over the edge of the table, nearly at a right angle, and made a median, vertical incision, beginning an inch above the patella, and extending nearly down to the tibial tubercle. The scar of superficial and deep wounds here fall over each other.

(*b*) Superficial Part of Approach by Lateral Flap of Overlying Skin and Fascial Structures: _ The patient usually lying with the limb outstretched _ the curved incision begins in the median line, about an inch above the patella _

and ends in the median line, just above the tibial tubercle _ but, between these points, curves laterad or mediad, according to convenience, for, approximately, an inch to the outer or inner side of the median line _ the greatest curvature being opposite the middle of the patella. The resulting superficial scar will, in this way, lie well to one side of the scar in the deep tissues.

(*c*) Deep Section of Patella and Quadriceps Extensor Tendon: _ Irrespectively of whether the superficial approach has been made by a straight median incision _ or by a curved flap incision _ the section of the underlying parts, into the joint, is made in the median line _ and is best accomplished by the rotary saw of an electric motor, for the patella _ and by a median bisection, with knife, of the quadriceps extensor tendon, above the patalla, and of its extension, the patellar ligament, below the patella. The margins of the bisected patella are now carefully drawn toward their corresponding sides with retractors _ all finger-handling of the joint structures being avoided _ and the suspected intra-articular structures examined _ or a general examination is made of the interior of the joint, if the case be one in which there has been no previous suggestive guide.

When the special object of the particular operation has been accomplished (see the operations upon the intra-articular structures of the knee joint, given in the neighboring pages), the wound is closed and the limb dressed and immobilized. Several ways of treating the deeper wound are employed: _ (*a*) The bisected patellar margins may be drilled (the drill-holes not entering the articular surfaces) and the bone margins brought together by kangaroo-tendon _ and the split borders of the quadriceps extensor tendon and of the patellar tendon similarly treated. (*b*) No form of suturing of the deep structures, patella or tendons, may be carried out _ the soft parts tending, naturally, to drop into their cleavage alignment. (*c*) The margins of the tendinous structures alone may be sutured with chromic catgut.

Comments.—Exposure of the knee-joint is sometimes made by an anterior transversely curved incision (v. p. 803, Vol. I).

EXPOSURE OF KNEE-JOINT FOR DISABILITIES, OR INTERNAL DERANGEMENT OF ITS STRUCTURES

By Single Lateral Axial, or Oblique Incision

Description.—The exposure of the knee-joint by single, one-sided incisions, vertical or oblique, is usually resorted to where the nature of the intra-articular involvement suggests its being more readily, or sufficiently reached and dealt with through such incision _ rather than through a median splitting of the overlying structures, as described at p. 931.

The usual conditions for which such exposure is made, are given upon the preceding page.

Operation.—One of two methods of making the unilateral incision may be employed: _

(*a*) Exposure by Shorter Lateral Oblique Incision: _ The knee is flexed, and lies upon its side. The incision is placed obliquely over the side of the joint which is uppermost _ extending from the margin of the ligamentum patellæ, above, and in front slightly downward and backward, to the anterior margin of the lateral ligament, behind.

(*b*) Exposure by Longer Lateral Axial Incision: _ The limb lies outstretched, and so placed as to present, prominently, the side to be operated upon. Sir Robert Jones prefers that the knee be bent over the end of the table, to a right angle, hanging loosely. He then makes a slightly curved 3-inch incision _ from 1 inch within the lower angle of the patella, to $\frac{1}{2}$ inch below the margin

of the tibia, where it curves slightly backward toward the lateral ligament. The incisions are correspondingly placed on either the lateral or medial aspect of the knee, as the case may be.

(*c*) The lips of the wound are held apart by retractors _ avoiding the carrying of the fingers into the joint. The special object of the operation (see the following operations) is sought _ and accomplished _ the joint wound closed by buried sutures _ the superficial wound sutured _ and the limb splinted.

OPERATION FOR LOOSE BODIES IN THE KNEE-JOINT

Varieties of Loose Bodies Encountered in the Knee-joint.—Fischer's Classification: _ (*a*) Loose bodies encountered in such conditions as osteo-arthritis, tabes, tuberculosis, acute arthritis from infection; _ (*b*) Detached portions of articular cartilages _ bodies derived from intra-articular cartilages _ bodies formed from detached epiphyses; _ (*c*) Synovial chondromata.

Incisions of Approach.—The following approaches are the most useful: _

(*a*) By median section of quadriceps extensor, patella and ligamentum patellæ _ for the most extensive procedures _ see p. 931.

(*b*) By popliteal incision (Brackett and Osgood) _ for bodies in the posterior aspect of the joint, especially when too large or too many in number to be readily removed through other avenues of approach. A posterior axial incision is made, about 4 inches long, with its center over the articular line _ and, through this, a careful dissection leads down to the popliteal floor, between the two separating heads of the gastrocnemius muscle _ encountering, in order, the internal popliteal nerve, vein, and artery _ which are retracted outward. The posterior aspect of the joint capsule is here opened _ and if the body have been accurately located, in advance, it is not apt to recede out of reach, owing to the small amount of space here available for such movement.

(*c*) By inner or outer anterolateral axial incision, just to the inner or outer side of the border of the patella _ for bodies in, or accessible from, the more anterior pouches of the joint.

(*d*) By external posterolateral incision (Tenney): _ Extend the knee and incise along the anterior margin of the prominent biceps tendon, toward the capsular ligament. Flex the knee and retract the biceps backward, exposing the iliotibial ligament _ which is to be limitedly incised and its margins retracted _ which will expose the capsule of the joint. The capsular ligament is, in turn, incised _ the incision passing either above or below the tendon of the popliteus muscle _ the latter giving access to the lowest part of the joint. This incision is well placed for approaching the postero-external aspect of the joint.

(*e*) By internal posterolateral incision (Tenney): _ Extend the knee and incise the structures along the anterior border of the sartorius muscle. Flex the knee, retract the sortorius backward _ and incise the joint capsule posterior to the internal lateral ligament.

(*f*) By limited incision directly over the intra-articular body: _ The body is first definitely located. If it does not shift its position, less difficulty is experienced. If it be movable, it should be steadied against some bony resistance, before the incision is made _ that it may not escape from reach.

OPERATION FOR INTERFERING INFRAPATELLAR PADS AND SYNOVIAL FRINGES

An excess of infrapatellar fat-pad may project into the joint _ and the alar ligaments, along with their connected fat-fringes _ and these may be pressed between the femoral and tibial articular surfaces.

Exposure of the joint is usually secured by an incision carried along the medial side of the lower part of the patella. The pad, or fringes, are then sought with forceps (so that the fingers will at no time enter the joint) — and whichever one is found protruding unnaturally into the joint, is removed by scissors — or both, if involved.

The joint wound is repaired in the usual manner — the part immobilized — and, later, while the joint remains non-weight-bearing, massage is maintained.

OPERATION FOR DISPLACEMENT OF THE SEMILUNAR CARTILAGES

Description.—Displacement of the internal semilunar cartilage, from various forms of injury, is a comparatively frequent occurrence — whereas displacement of the external semilunar cartilage is much less common.

Operation.—The knee-joint is usually opened by either the vertical incision to the side of the patella corresponding with the involved semilunar cartilage (v. p. 932) — or by the median bisection of the patella (v. p. 931). An Esmarch bandage is generally applied in advance.

The cartilage must be examined carefully, especially its posterior aspect, damage to which is here apt to escape detection. The parts should be handled, throughout, by instruments. A recently split or torn cartilage is sometimes found — and is frequently sutured back into position by fine chromic catgut. The temptation is to thus save the cartilage. But many excellent Surgeons — some who deal most largely with these problems — advise the removal of the cartilage, in all questions of doubt — as recurrence of suffering so often follows partial excision. They even counsel the removal of a but slightly movable cartilage. The removal of the entire cartilage is said to be followed by no disability.

In completing the operation, the joint structures are to be sutured layer by layer — and the limb immobilized in a posterior splint, at about 10 degrees, for about ten days — after which, the patient walks, with the limb fixed at the same angle, for another ten days. The knee is then supported by bandage alone — and massage of the thigh instituted.

OPERATION FOR GENU VALGUM (KNOCK-KNEE), BY SUPRACONDYLAR OSTEOTOMY

In genu valgum, or knock-knee, there is an unusual inward prominence of the knee — the lower leg deviating outward at an abnormal angle from the axis of the femur.

In marked deformity, in children over three years of age, and if no local acute condition be present, operation is indicated.

In some cases, the tibia may be as much distorted as the femur, or more so — but, ordinarily, osteotomy of the femur, just above the condyle, will correct the deformity.

Linear Supracondylar Osteotomy, with an Osteotome.—The technic of performing the operation, is described and pictured in Vol. II, pp. 290–293.

At the end of the operation, the outward rotation of the leg is corrected — and the limb immobilized, with the leg in the position of a mild grade of bow-leg, or in overcorrection — and this position is maintained for about three months.

Cuneiform Osteotomy of the femur is rarely indicated.

Linear Osteotomy of Both Femur and Tibia is sometimes indicated — or Linear of one, and Cuneiform of the other.

OSTEOTOMY, FOR ANKYLOSIS OF THE HIP-JOINT

Transtrochanteric osteotomy in hip-joint ankylosis in bad position _ in those cases where no pronounced pathologic condition is present at the site, and the neck of the bone is non-absorbed _ is usually regarded as the best form of dividing the femur.

This may either be performed through an open operation _ or subcutaneously _ and by either a saw, or a chisel.

Draw downward, with the thumb, the skin over the region of incision, so that it may afterward return to its position, constituting a valve-like approach. Make a small incision overlying the intertrochanteric line, beginning about ¾ inch below the great trochanter, and extending boldly to the bone. Insert the knobbed end of an Adams saw into the wound, *before* withdrawing the knife, and carry it down upon the latter, as a guide, until the intertrochanteric line is reached _ after which, withdraw the knife _ and saw the bone four-fifths of the way through, approximately _ at which point, it usually yields, or can be carefully fractured through the remaining bridge-work of bone. If it be indicated, the adductor muscles may be divided _ and the limb is put up under abduction.

Subtrochanteric osteotomy (Fig. 1248) may be performed (except in cases of extreme flexion) where it is indicated to avoid the intertrochanteric line (as where the intertrochanteric line represents either a former site of disease, or a presently progressive one).

Wedge-shaped osteotomy is usually performed where marked absorption of the femoral head and neck have occurred _ where the trochanter is elevated, through pathologic dislocation _ and where there is a bulky mass of bone. It is generally necessary, in these cases, to also divide the adductor muscles. The limb is put up in abduction _ and, sometimes, under traction. This form of osteotomy, illustrated upon the tibia, is seen in Fig. 1251.

OPERATION FOR THE PRODUCTION OF PSEUDARTHROSIS, IN ANKYLOSIS OF THE HIP-JOINT

Jones

This procedure is especially adapted to frail, or elderly persons, in whom the greater traumatism of excision might be contraindicated. It is non-admissible in children.

The technic consists in the removal of the outer portion of the great trochanter _ dividing the neck of the femur _ and then screwing, or nailing the detached piece of the great trochanter, to the proximal end of the divided femoral neck, so as to prevent reunion of the ends of the severed femur.

Make an axial incision, of 6 inches, with its center over the great trochanter _ and another incision, crossing the base of the trochanter, just below the insertion of the gluteal muscles. Deepen this incision, exposing the great trochanter.

Remove, by means of a very wide osteotome, or by saw, a slice of the great trochanter, by a section extending from the outer aspect of its base, obliquely upward to its junction with the neck of the femur _ and retract it upward.

Incise the capsule _ and separate the neck of the femur by means of an osteotome. Practice traction upon the femur, to separate the femoral shaft from the neck, at the site of section _ and, through the working-room thus gained, the separated trochanter, with its muscles still attached, is screwed, or nailed to the severed head of the femur _ the femoral head remaining permanently in its acetabulum _ reunion with the femoral neck being prevented by the interposed slice of the trochanter _ the normal outer aspect of the tro-

chanter coming into contact with the freshly divided aspect of the upper end of the femoral shaft.

The wound is closed by buried and superficial sutures _ after which, the limb is kept immobilized for about nine days, when graded movements are commenced. The patient first walks with a caliper splint, to remove all strain on the joint.

In instances of tender hip-joint, a section of the femur is sometimes removed, so as to avoid impinging.

If a sound joint be ankylosed, the femoral neck is divided close to the acetabulum.

SUBTROCHANTERIC CIRCULAR OSTEOTOMY, FOR COXA VARA

Coxa vara is characterized by depression of the neck of the femur, generally occurring in conjunction with some degree of twisting of the shaft of the femur. Some form of osteotomy is usually indicated, when non-operative measures fail _ especially in fixed adduction.

Circular osteotomy is preferable to linear osteotomy, as it avoids the corner-on-corner effect of linear osteotomy _ and the shortening of cuneiform osteotomy.

Albee's method of performing this technic is described by him as follows (Brackett's operation being the original procedure): _ "Brackett's technic has been modified by the author by prolonging the inner portion of the curved incision downward, to make a long lip on the internal aspect of the upper fragment, just below the trochanter minor, so that the central point of the convex surface of the lower fragment is exactly opposite the central point of the concave surface of the upper fragment, thus providing an additional safeguard against sliding by and possible displacement of the two fragments and a broader surface of contact. The author uses his motor drill in making the circular osteotomy, connecting the holes with Jones' saw."

In exposing the site, an anterior incision is made over the hip-joint, which will expose the bone from the external aspect of the great trochanter, to the inner side of the neck of the femur at its junction with the shaft.

In moderate degree of involvement, the limb should be put up in a position half-way between abduction and adduction _ and in cases where the femoral head touches the femur, the head and neck should be excised and the limb put up abducted and hyperextended.

OPERATIONS FOR CONGENITAL DISLOCATION OF THE HIP-JOINT

Reduction by manipulation is the method of choice, where this is attainable.

The age limit at which the manipulative method should be applied was put, by Lorenz, at the end of the seventh year, in bilateral dislocation _ and at the end of the tenth year, in unilateral dislocations.

Various methods of manipulation are in use _ but their consideration do not come under our heading.

Operative measures for reduction are of different kinds _ the general nature of which will be summarized: _

Arthrotomy.—The approach may be made by the Sprengel-Smith-Peterson incision _ beginning about 4 inches below the anterior superior iliac spine _ passing, thence, upward, along the outer border of the sartorius muscle, to the anterior spine _ and thence backward along the iliac crest. The incision, in the Hoffa-Lorenz operation, is an anterior one, along the external border

of the tensor vaginæ femoris _ through which the joint capsule is exposed. The interior of the joint is digitally examined _ including the head of the femur and the acetabulum. The femoral head may be replaced by a shoe-horn-like instrument _ or may be variously remodeled and replaced. The soft parts are restored _ the wound closed _ and the limb, or limbs put up in the characteristic position used in reduction by manipulation.

Osteotomy.—This procedure is more apt to be called for in cases of ten to thirty years. The adductors are divided and a subtrochanteric osteotomy performed.

Excision of the Head and Neck of the Femur.—This may be resorted to in adult life _ where there may be stiffness, arthritis, and deformity.

Operation by Bone-graft Wedge Remodeling Operation _ Albee.—Quoting from Albee: _ "All existing contractures having been overcome by forcible manipulation under ether, the hip-joint is entered by the Smith-Peterson (Sprengel) route. An incision is made from the anterior superior spine of the ilium to the great trochanter, thence backward, 1 or 2 inches, in the direction of the ischial tuberosity; the skin and subcutaneous structures are dissected back and the trochanter is exposed; the tip of the trochanter is developed with its muscle attachments and sawed off with the motor saw. The trochanter tip with its attached muscles is turned upward, giving a free exposure of the superior and posterior portions of the capsule of the joint, together with its attached portion on the superior and posterior acetabular rim; this portion of the capsule is seen and felt to be lax, if the head is in the acetabulum, and if the head of the femur is disarticulated, it distends the capsule by pressure from beneath and further displacement of the head is resisted. Upon manipulation of the femur, the head is readily felt as a rounded, hard surface slipping about beneath the capsule.

The amount of deficiency of the acetabular rim can be very easily determined at this stage by direct palpation, and manipulation of the thigh, and also the amount of laxity of this portion of the capsule. Above the capsular attachment to the acetabular rim, the bone surface is cleared of soft tissue, and with a narrow, thin osteotome the bone is incised just above the insertion of the capsule in a semicircular line in this postero-superior-anterior surface at the outer border of the insertion of the capsule into the pelvis, to conform co the natural curvature of the superior rim of the acetabulum. This semitircular bone incision produces a strip of the superior curved bone margin of the acetabulum with its attached and undisturbed capsule segment. This curved acetabular bone segment is pried downward and outward with the osteotome to deepen the acetabulum sufficiently to offer an obstruction to displacement of the femoral head, *i. e.*, this superior curved rim of the acetabulum is made to overhang and more securely grasp the head of the femur when placed in the socket. The prying downward and outward of this curved superior bony rim segment produces still more laxity and wrinkling of the attached portion of the capsular ligament. The slack is taken up by reefing this portion of the capsule by a row of mattress-sutures of kangaroo-tendon placed obliquely to the long axis of the neck of the femur. The stitches are so placed as to make the reef of the capsule lie equidistant from the two ends of the capsular bone insertions. This reefing avoids entering the joint, takes up the slack of the capsule, and, at the same time, holds the newly formed or placed acetabular rim in position.

One may or may not incise the capsule (in a direction corresponding to the neck of the femur) at its superior surface, for the purpose of more accurate orientation and for inspection of the rim of the acetabulum.

To fill in the bone gap produced by the prying downward and outward of

this curved bone rim, and further to secure the permanent fixation of this new-formed acetabular rim, proceed as follows: –

After the rim of acetabulum has been depressed, one or two small wedge-shaped portions of the upper surface of the gap are removed with a sharp osteotome, and into these are inserted the beveled ends of short tibial bone-grafts (about ¾ to 1 inch in length). The other ends of these grafts rest on the depressed portion of the acetabular rim, thus producing permanent overhanging of the latter. When such grafts have been inserted, the more the pressure from muscle spasm or weight-bearing exerted on the rim of the acetabulum, the more firmly are the grafts held in place.

OPERATIVE TREATMENT, IN SPASTIC PARALYSIS

Robert Jones' Routine

Spastic Paralysis, or Little's Disease, is a lesion of the upper neuron, the cerebral cortical source of impulse of movement – from disease or injury of the motor centers of the cerebrum which control the extremities. Following the removal of cerebral inhibition, muscular tonus becomes exaggerated – the reflexes, hyperactive – resulting in a state of hypertonicity in the parts involved – the limbs becoming useless from hypertonicity, ranging from irritability to spastic rigidity. Marked muscular contraction, rather than loss of muscle power (which may also be present), results in a limb as powerless as though paralyzed, though not, strictly, paralyzed.

The treatment of spastic paralysis is mechanical – operative – and re-educational.

Operative treatment is not the final objective, but is carried out in preparation for muscular re-education.

Technical Procedures, in Operative Treatment: –

Operations upon Muscles, or Tendons: – Tenotomy – Myotomy – Muscle Transplantation.

Operations upon the Nervous System: – Alcohol infiltration of nerves – Division of posterior nerve roots (Foerster's operation) – Division of muscular branches of motor nerve (Steffel's operation) – Cerebral decompression.

Emphasis is laid, in the Jones routine, upon operations on the muscles themselves, preparatory to muscular re-education – rather than upon operations on the brain or cord.

The child, or adolescent, to be considered a fit subject for operation, should be at least four to five years of age, in whom mental development is fair – free of acute or progressive involvements – and amenable and capable of discipline and muscular re-education.

The preoperative carrying out of mechanical and manipulative treatment for a year in advance of adopting operative measures, is usually considered a wise course.

Tenotomy and Myotomy in the Lower Extremity.—To enable the patient to walk more naturally, tenotomy and myotomy is performed in order to weaken and lengthen the spastically contracted muscles – so as to lessen the continuous and irritant afferent impulses from these muscles.

The patient should be tested in standing, lying, and sitting postures before determining the nature and grade of the contemplated operation.

Operation for Equinus Position of the Foot.—Lengthen the tendo achillis by means of plastic tenotomy, performed through open exposure, and by accurate calculation – and immobilize the foot at an exact right angle, by a plaster dressing extending above the knee.

Operation for Knee Flexion.—Divide, transversely, the two hamstrings

– preserving the biceps, except in marked cases. But exceptionally called for – after tenotomy of the tendo achillis.

Operation for Adductor Contraction.—Make a subcutaneous, or an open section – preferably the latter – and divide the adductor longus muscle, about an inch below its origin – and whatever other structures resist under abduction – usually the adductor magnus, adductor brevis, and sometimes the gracilis and pectineus – as well as any fascial bands. The limb is put up as much abducted as possible – and rotated outward.

If inward rotation persist – make an incision parallel with the iliac crest, terminating at the anterior superior iliac spine – and, through this, detach the muscular origin of the gluteus medius and tensor fasciæ femoris, and free them from the bone for about 1½ inches from the crest – and from the notch between the anterior superior spine and anterior inferior spine – thereby practically lengthening the muscle. In lieu of this, detach, by knife-cut, the gluteus medius tendon from the great trochanter. The limb is put up in plaster-of-Paris spica, or in a Thomas double-hip abduction splint, in marked abduction and outward rotation, for about six weeks.

Muscle transplantation is not recommended at the ankle.

Transplanting the Biceps to the Patella.—This represents the best tendon transplantation at the knee.

Expose the biceps, by an 8- to 12-inch incision over its course, from its fibular attachment, upward. Divide the tendon at its insertion and free it from its surroundings. Similarly divide the lower half of the fibers of the short head of the biceps from its femoral attachment.

Make a tunnel through the connective tissue upon the outer aspect of the thigh, and conduct the biceps tendon through this tunnel, and anchor it into an incision made in the upper anterior border of the patella.

The semitendinosus is also sometimes employed to reinforce this transplantation.

To Correct Marked Inward Rotation of the Shoulder.—Expose and divide the tendon of the pectoralis major – and in very severe adduction and inward rotation, it may also be indicated to divide both the tendons of the pectoralis major and subscapularis.

To Correct Spasmodic Pronation – Jones' Operation.—The insertion of the pronator radii teres is so changed that it may supinate the forearm – and is accomplished by detaching the muscle from its normal attachment, and inserting it into the extensor carpi radialis longior et brevior. Through an incision overlying the insertion of the pronator radii teres, expose the supinator longus, and retract it radiad, away from the extensor of the wrists, which are thereby brought into the field. Separate the wide insertion of the pronator radii teres from the radius, in its entire extent. While the hand is dorsiflexed, cut slits in the extensor carpi radialis longior et brevior, and suture the detached pronator radii teres into these – as low as possible. Put up the limb with the hand in dorsiflexion and complete supination, and so maintain for three or four weeks.

To Correct Adduction and Flexion of the Hand.—The object of this operative correction, is to transpose the extensor carpi ulnaris tendon into the three thumb extensors. The wound of approach consists of a 4-inch incision passing upward, from the insertion of the extensor carpi ulnaris, and ½ inch to its outer aspect. Sever the tendon at its insertion and free it throughout the rest of the wound. Make slits in the three extensors of the thumb, and anchor the distal cut end of the extensor carpi ulnaris into these extensors, while the thumb is markedly abducted. Put the hand up dorsiflexed, with the thumb abducted.

To Correct Marked Palmar Flexion.—Jones and Lovett recommend transposing the flexor carpi ulnaris tendon into the extensor carpi ulnaris _ and the pronator radii teres into the radial extensors _ thereby strengthening dorsiflexion.

Section of the Posterior Nerve Roots _ to Block Sensory Transmission _ Foerster's Operation.—The object of this procedure (first worked out by Foerster to relieve the crises of tabes dorsalis) is to block the irritating sensory impulses which are passing centrad, to be expressed as hypertonic, uncontrolled muscle movements. The reflex arc is thus broken upon its sensory side.

For the upper extremity: _ Through a laminectomy, the posterior nerve roots of the third, fourth, and fifth lumbar nerves _ with the first and possibly the second sacral _ are divided. Later, Foerster advised electrically identifying the first and third lumbar roots, to the anterior thigh muscles, and conserving these.

For the upper extremity: _ Through a similar exposure, the posterior roots of the four lower cervical and the first dorsal nerves are divided.

These severe measures are rarely warrantable _ and then, only in the most expert hands. Paralysis is at first complete, but power soon returns. Various peripheral irritations are due to occur.

Section of the Anterior Nerve Roots _ to Block Motor Transmission _ Stoffel's Operation.—The object of this technic, is to break the reflex arc upon its motor side.

The object of this technic, is to partially excise the nerve-fibers which go to strongly contracting muscles _ thereby hoping to establish a new and more even muscle balance.

The following summary of the operation is made from Bruce Gill's description of the technic: _

(*a*) Operations involving the Median Nerve: _ Expose the median nerve at the bend of the elbow _ isolate the nerve-branch to the superficial head of the pronator radii teres, and excise several inches of its extent. Locate, with electric needle, the branches to the flexor carpi radialis, palmaris longus, and deep head of the pronator radii teres _ isolate them from the body of the median nerve, and from each other, test them electrically, and, in marked cases or pronation and flexion contracture, excise them. In less marked cases, excise a portion of them. In severe cases also excise the nerve to the pronator quadratus.

Further separate the median nerve into its constituent bundles, by testing with the electrode _ and excise as many of the bundles to the flexors of the fingers as may be indicated _ the bundles lying upon the dorso-ulnar aspect of the median nerve.

The branches of the ulnar nerve to the flexors of the wrist and fingers may be similarly treated, at a later period, if indicated.

(*b*) Operations involving the Obturator Nerve: _ An incision from the spine of the pubis, extending downward along the adductor longus tendon, is made. The adductor longus tendon is retracted outward, and the anterior branch of the obturator nerve is isolated in the intermuscular fascia, dividing, usually into three branches. Carry the dissection to the obturator foramen _ and isolate the posterior branch of the obturator nerve, as it comes from the obturator foramen, or passing behind the anterior aspect of the obturator externus, posterior to the adductor brevis. The anterior branch of the obturator, or its indicated branch, may be excised _ supplying the gracilis, adductor longus, and all, or a portion of the adductor brevis. The posterior branch supplies the obturator externus, adductor magnus, and, sometimes, the

adductor brevis _ and may be excised. Considerable power of adduction is left, if either anterior or posterior branch be excised.

(*c*) Operations involving the Sciatic Nerve: _ Expose the nerve through an axial incision, made downward from the gluteal fold, middistance between the ischial tuberosity and the great trochanter. Recognize the long head of the biceps _ retract it inward _ and seek the nerve beneath its border. Locate, on the median side, the trunk supplying the long head of the biceps, semimembranosus, and semitendinosus, and verify by electrode. In moderate spastic contracture, excise, entirely, the branches to the biceps and the semimembranosus _ thus leaving intact the short head of the biceps and all the semitendinosus. In marked cases, excise, entirely, the branches to the biceps and to the semimembranosus, and one-third of the supply to the semitendinosus _ leaving intact the short head of the biceps and, on the median aspect, the greater part of the semitendinosus.

(*d*) Operations involving the Internal Popliteal Nerve: _ This procedure is for correcting pes equinus, or pes equinovarus. Expose the internal popliteal nerve in the middle of the popliteal space. In moderate cases of pes equinus, the nerves to the two heads of the gastrocnemius are excised. In severer cases, approximately one-half of the nerve to the dorsal part of the soleus is also excised. In still severer cases, the entire tract is excised. If the flexor longus digitorum be involved, part of its supply may be excised. If there be marked pes varus, part of the supply of the tibialis posticus is excised.

OPERATIVE MEASURES FOR THE IMPROVEMENT OF FUNCTION, FOLLOWING SOME OF THE LESIONS OF INFANTILE PARALYSIS

The essential and only object of operation, following the lesions of anterior poliomyelo-encephalitis, or infantile paralysis, is to improve the function of the involved part, or parts _ and to secure stabilization, _ remembering that the chief function of the upper extremities is prehension _ and of the lower extremities, weight-bearing.

The chief operations for Improving Function, are: _ (*a*) Methods of Tendon Transplantation, _ (*b*) Methods of Nerve Transplantation.

The chief Methods for Improving Stability, are: _ Arthrodesis _ Osteotomy _ Bone lengthening _ Tendon Fixation _ Bone excision _ Fascial transplantation _ Muscle transplantation _ Tendon transplantation _ Silk ligaments.

In consideration of these subjects, the works of Jones and Lovett, and of Albee will be largely followed.

A. Tendon Transplantations

In Talipes Varus and Equinovarus, from Paralysis of the Peroneal Muscles: _

Substitution of the anterior tibial _ cut the tendon along with its bony attachment from the inner aspect of the internal cuneiform and from the proximal end of the first metatarsal, and freeing the muscle to its tibial origin. Pass the muscle through a subcutaneous tunnel and anchor it to the external cuneiform.

In Talipes Valgus, with Paralysis of the Anterior Tibial, but with Integrity of the Peroneals: _

Transplant the peroneus longus, or brevis, or both, from their usual position, to or internal, to the mechanical center of the foot. It is sometimes combined with arthrodesis of the astragaloscaphoid joint.

In Talipes Calcaneus:—

When there remains some power in the gastrocnemius, with good posterior tibials and peronei, these tendons may be anchored to the back of the os calcis.

In Talipes Valgus, from Paralysis of the Posterior Tibial Alone:—

Either the flexor longus hallucis may be substituted, by transplanting its tendon to the internal aspect of the internal cuneiform—or the tendon of the peroneus longus may be carried beneath the tendo achillis and anchored to the inner border of the internal cuneiform.

In Talipes Equinus:—

In this condition, occuring from paralysis of the anterior tibial and larger extensors of the toes, with, at the same time, non-involvement of the proprius hallucis—the tendon of the extensor proprius hallucis may be transplanted, by bony insertion, into the middle cuneiform—using that portion of its length extending from its insertion, to the last phalanx of the great toe.

In Talipes Calcaneus, from Paralysis of the Gastrocnemius and Soleus:—

Either the peroneus longus and peroneus brevis—or the tibialis posticus—may be transplanted. Additionally, it is well to either excise the astragalus—or do Jones' operation for shortening the tendo achillis—dislocating the foot backward.

Transplantation of the Hamstrings, in Paralysis of the Extensor Cruris:—

Flexion of the knee must be overcome before the operation of transplantation.

The biceps alone (outer hamstring) may be transferred to the paralyzed quadriceps extensor cruris.

Additional power is secured if, besides the above transplantation of the biceps, the inner hamstrings are included in the transplantation.

Transplantation of the Sartorius, in Paralysis of the Quadriceps Extensor:—

The sartorius is sometimes transplanted, to replace the quadriceps extensor, this comparatively small muscle hypertrophying under usage.

In Paralysis of the Gluteus Medius and Minimus.—Lange advised the transplantation of the vastus externus to the crest of the ilium, to aid abduction of the thigh.

In Paralysis of the Gluteus Medius.—Legg suggests transplantation of the tensor vaginæ femoris into the raised periosteum of the femur, $1\frac{1}{2}$ inches below the great trochanter.

In Paralysis of the Deltoid:—

The trapezius has been transplanted, and made to replace the deltoid—and so has the pectoralis major—but not with marked success, in either technic.

In Paralysis of the Extensors of the Fingers and Hands, Accompanied by Finger-drop and Wrist-drop:—

The flexor carpi radialis may be anchored to the extensor tendons of the fingers, by threading it through these.

In Paralysis of the Flexors of the Hand and Fingers, from Involvement of the Ulnar and Median Nerves:—

The extensor carpi radialis brevis, extensor carpi radialis longus, and brachioradialis may be transplanted to replace the flexor of the thumb, and the flexors of the index and middle fingers.

B. Nerve Transplantation

(*a*) Healthy nerves have been transplanted into impaired nerves _ with resulting functionating of the muscles supplied by the involved nerve.

(*b*) Healthy nerves have been transplanted into impaired muscles, with functionation of the involved muscles.

While both of these technical procedures have been proved capable of execution, neither procedure has been put into general use, as applied to these cases.

C. Operations for the Improvement of Stability

The chief means employed for stabilization, is some form of arthrodesis _ which may be employed alone _ or, as is often done, in conjunction with some form of tendon transplantation.

Arthrodesis of the Ankle-joint.—(See Vol. II, p. 398.)

Arthrodesis of the Knee-joint.—(See Vol. II, p. 398.)

Arthrodesis of the Hip-joint.—Is usually not a satisfactory procedure. When employed, the head of the femur and the cavity of the acetabulum are completely denuded.

Arthrodesis of the Shoulder.—If the shoulder be flail and the paralysis complete, and muscle transplantation inapplicable, the condition may be aided by arthrodesis.

Arthrodesis of the Elbow.—Only indicated in flail joint, where there is no prospect of securing joint functionation through tendon transplantation.

Arthrodesis of the Wrist.—Is sometimes performed in wrist-drop and in complete paralysis of the extensors.

Arthrodesis, with Excision of Bone, for Calcaneocavus _ Jones' Operation.—A transtarsal V-shaped section of bone is excised _ wider on the inner than on the outer side, if there be valgoid deformity. At a second operation, the foot is brought into slight plantar flexion by arthrodesing the ankle and the astragalo-calcaneal joints.

Operation for Shortening the Foot _ Dunn.—A section of the foot is excised, including the articular aspects of the os calcis and cuboid _ the head of the astragalus _ and the proximal cartilage of the cuneiform bones, and all of the scaphoid. If equinus is present, tenotomy of the tendo achillis is performed. The head of the astragalus finally is approximated to the cuneiforms _ and the raw surfaces of the cuboid and os calcis.

Operative Lengthening of a Short Leg _ Jones' Operation.—The femur is exposed through an external incision _ divided axially, over the indicated length _ the two halves transversely divided in opposite directions at the ends of the axial incisions _ and the two split halves of the bone slided past each other as far as desired, when they are anchored to each other by a wire loop.

Osteotomy of the Hip and Knee.—If this be indicated, as it rarely is, a subtrochanteric osteotomy is performed at the hip, and a supracondyloid osteotomy at the knee.

Tendon Fixation (Tenodesis, in General).—Consists in the conversion, functionally, of the tendons of paralyzed muscles which pass over joints, into ligaments. These tendons are so anchored, in bone-grooves and under periosteal and fascial structures, as, in their tautened state, to serve as ligaments. Tendons thus anchored are, unfortunately, apt to stretch.

Usage of Silk Ligaments as Artificial Ligaments.—Accomplished by stretching strands of silk between articulating ends of bones, to check movements. The silk becomes covered or coated with fibrous tissue.

Formation of Ligaments by Free Fascial Transplants.—Such layers of fascia as may be secured from the fascia lata are utilized _ being rolled into cords and used as the silk ligaments just described.

OPERATIONS CORRECTIVE OF DEFORMITIES OF SPECIAL STRUCTURES AND ORGANS

These will be found in the various preceding chapters of the work _ and may be located in the chapter captions _ in the Index of the special volume _ and in the General Index.

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